



United States Department of the Interior

FISH AND WILDLIFE SERVICE

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Memorandum

June 24, 1996

To: Chief, Division of Consultation and Conservation Planning, Ecological Services,
Portland, Oregon (Attention: Vicki Finn)

From: Supervisor, North Pacific Coast Ecoregion, Western Washington Office,
Olympia, Washington

Subject: Intra-Service Biological Opinion on the Proposed Issuance of an Incidental Take Permit
(PRT-808398) for Northern Spotted Owls, Marbled Murrelets, Grizzly Bear, and Gray
Wolf to Plum Creek Timber Company (FWS Reference 1-3-96-FW-190) and the
Approval of an Unlisted Species Agreement for all Vertebrate Species
1-3-94-TA-27a

This memorandum constitutes the U.S. Fish and Wildlife Service's (Service) biological opinion on the issuance of a Section 10(a)(1)(B) incidental take permit to Plum Creek Timber Company, L.P. (Plum Creek), based upon the Habitat Conservation Plan (HCP) and Implementation Agreement (IA), in accordance with Section 7(a)(2) of the Endangered Species Act of 1973 (16 U.S.C. 1536 et seq.)(Act). This biological opinion addresses the effects of permit issuance on the northern spotted owl (*Strix occidentalis caurina*), a federally listed threatened species; the marbled murrelet (*Brachyramphus marmoratus marmoratus*), a federally listed threatened species; the grizzly bear (*Ursus arctos* = *U.a. horribilis*), a federally listed threatened species; and the gray wolf (*Canis lupus*), a federally listed endangered species. This opinion also addresses the bald eagle (*Haliaeetus leucocephalus*), a federally listed threatened species; and the peregrine falcon (*Falco peregrinus*), a federally listed endangered species. The proposed IA between Plum Creek, the Service, and the National Marine Fisheries Service (NMFS) also includes an unlisted species agreement for all vertebrate species which may be found in the habitats which occur in the Planning Area. Consultation would be reinitiated prior to adding any additional species to the incidental take permit.

NMFS has completed an analysis of the effects the HCP and IA would have on salmonid species under their jurisdiction (USDC 1996). That analysis is incorporated herein by reference.

The Service has considered whether or not the proposed action is likely to adversely affect the bald eagle or peregrine falcon. The Service believes that the proposed action is not likely to adversely affect either species; nevertheless, it has included these species in this formal consultation.

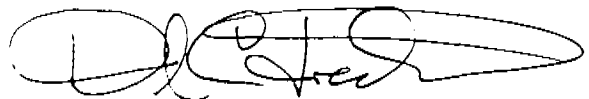
CONSULTATION HISTORY

A preliminary species list was prepared on March 3, 1994. During the next 2 years, the Services provided technical assistance during HCP development and participated in the preparation of an Environmental Impact Statement (EIS). The Service and NMFS (together the Services) conducted early data-gathering for this biological opinion in conjunction with preparation of the draft HCP. In addition, on July 7, 1995, Service staff met with representatives from the Washington Department of Fish and Wildlife (WDFW) to prepare for this analysis and discuss methods to be used regarding analysis of take and impacts for the northern spotted owl.

On September 11, 1995, the Services received a completed application package. A Federal Register notice was published on November 17, 1995 (60 FR 57722) which announced the release of the draft HCP and draft EIS (DEIS)(USDI and USDC 1995) to the public. An additional Federal Register notice was published by the Environmental Protection Agency announcing the availability of the DEIS on November 24, 1995. The comment period was scheduled to close on January 8, 1996; however, on January 4, 1996, the comment period was extended until January 22, 1996. Notice of this extension was published in the Federal Register on January 17, 1996 (61 FR 1193).

After considering public comments, the Services addressed concerns raised about the HCP and discussed alternative approaches with Plum Creek. Upon completion of these discussions, the Service prepared a Final Environmental Impact Statement (FEIS)(USDI and USDC 1996), including the changes made to the HCP and IA. Notice of Availability for the FEIS was published in the Federal Register on April 12, 1996 (61 FR 16257). A greater level of detail on the plan-development process is provided in the Context Section of the FEIS.

Consultation was initiated on February 13, 1996. This biological opinion is based on information provided in the Multi-Species Habitat Conservation Plan on Forestlands owned by Plum Creek Timber Company, L.P., in the I-90 Corridor of the Central Cascades Mountain Range, Washington (Plum Creek Timber Company 1996), the Final Environmental Impact Statement for the Proposed Issuance of a Permit to Allow Incidental Take of Threatened and Endangered Species: Plum Creek Timber Company, L.P., Lands in the I-90 Corridor, King and Kittitas Counties, Washington (USDI and USDC 1996), the Implementation Agreement for the Plum Creek Timber Company, L.P., Multi-species Habitat Conservation Plan (Plum Creek et al. 1996), 13 technical papers prepared to support the HCP, and various other documents cited later in this document and listed in the Literature Cited Section.

A handwritten signature in black ink, appearing to read 'D. C. Frederick', with a long horizontal flourish extending to the right.

David C. Frederick

bv/kr

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Service Action

Plum Creek has applied to the Service for a permit authorizing incidental take of the northern spotted owl (owl), marbled murrelet (murrelet), grizzly bear (bear), and the gray wolf (wolf) under Section 10(a)(1)(B) of the Act and has also requested that the Services enter into an "unlisted species" agreement to conserve currently unlisted fish and wildlife species which may be associated with habitats on their properties in the Planning Area. The proposed IA would provide that, should any of these species be listed in the future, Plum Creek may request that they be added to the permit. At that time, the Service would reinitiate consultation pursuant to Section 7 of the Act and make a determination that the species may be added, that additional mitigation is required from Plum Creek before such species may be added due to extraordinary circumstances, or that the species cannot be added because to do so would appreciably reduce the likelihood of survival and recovery of the species in the wild. Plum Creek proposes to manage its lands within the Planning Area pursuant to the HCP and IA that were developed as part of their permit application. The term of the proposed HCP and the proposed permit would be 50-100 years. Some aspects of the HCP and IA may terminate at year 50 (Phase I) while others (Phase II) may continue for an additional 50 years. The HCP and IA would allow for the possibility of early termination of the permitted activity by the applicant subject to the permit condition requiring that any past incidental take has been sufficiently mitigated prior to termination. Other provisions for revocation by the Services or amendment are included in the draft IA, including a provision for termination of the HCP with respect to any unlisted species for a material violation of the HCP with respect to that species.

Area Description and Location

For purposes of consultation under Section 7 of the Act, the "action area" is defined at 50 CFR 402 to mean "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." Although the actions which might potentially cause impacts to listed and other covered species are restricted to the area owned by Plum Creek and covered by the Permit (termed the Project Area in the IA and the HCP area in the HCP), the effects of the proposed action on these species may extend beyond this area. For purposes of this consultation, the Service has defined the action area to include the Project Area and the adjacent and interspersed Federal, State, and private lands described as the Planning Area in the HCP and EIS.

The subject ownership or Project Area occurs in a "checkerboard" pattern in an area commonly referred to as the Interstate-90 (I-90) Corridor. The term "checkerboard" refers to alternate sections of public and private land. The outer boundaries of the "planning" area encompass 418,690 acres; but, because of the checkerboard configuration of land ownership, the area includes 249,513 acres of other ownership. Plum Creek's ownership in the Planning Area is generally intermingled with Federal lands, and consists of 169,177 acres of alternating sections (1 square mile) of Plum Creek lands bordered, mainly, by Federal lands administered by the U.S. Forest Service.

The land-designations for the Federal lands are presented in Figure 10 and Table 4 of the HCP. Within the Planning Area, about 45 percent of the Federal land is designated as Adaptive Management Areas (AMA), 27 percent as Late-successional Reserve (LSR), and the majority of the remaining Federal lands are Matrix. The total area within the HCP boundary encompasses 418,690 acres, with the following ownerships:

●	U.S. Forest Service	201,801 acres
●	Plum Creek	169,177 acres
●	Other (State and private)	41,079 acres
●	Water (i.e., lakes, streams)	6,633 acres

Plum Creek's ownership within the Planning Area is located both east and west of the Cascade Mountain crest along the I-90 corridor in central Washington, between 60 to 100 miles east of Seattle. In selecting the geographical boundaries for implementation of the HCP (HCP Figure 1), Plum Creek considered proposed Growth Management Act zoning in King and Kittitas Counties, the potential habitat of the species to be protected, and the anticipated future activities that might result in incidental take of the above mentioned species. Plum Creek's timberlands in the Planning Area incorporate portions of 11 Townships on the western slopes of the Cascade range, and 19 Townships on the eastern slopes of the Cascade range (HCP Appendix 1).

The predominant nonfederal land use in the I-90 corridor and surrounding areas is commercial timber production. Federal lands are managed for multiple uses, but timber harvest has traditionally been one of the most significant land uses that has affected wildlife habitat.

Plum Creek's timber base west of the Cascades is predominately Douglas-fir (*Pseudotsuga menziesii*). Other important commercial species include western hemlock (*Tsuga heterophylla*), noble fir (*Abies procera*), Pacific silver fir (*Abies amabilis*), western redcedar (*Thuja plicata*), Sitka spruce (*Picea sitchensis*), and red alder (*Alnus rubra*). Forest classes (Jensen 1995) found on the West Side include the Douglas-fir/western hemlock class at lower elevations and the silver fir/noble fir class at higher elevations.

The pine-larch-Douglas-fir forests found in the portion of the Planning Area east of the Cascades receive limited precipitation except on the mountainous regions and much of that occurs as snow. With low summer precipitation, only tree species such as Douglas-fir, lodgepole pine (*Pinus contorta*), and ponderosa pine (*Pinus ponderosa*) can tolerate the summer drought. Forest conditions at higher elevations of the east-side Cascades (i.e., the transition zone) are very similar to conditions in the west-side Cascades. Forest classes occurring on the East Side include the ponderosa pine/lodgepole pine class in drier, low-elevation areas; Douglas-fir/grand fir (*Abies grandis*) class; and, at higher elevations, the subalpine fir (*Abies lasiocarpa*)/silver fir/noble fir class. The deciduous forest class occurs primarily in isolated pockets on the East Side and moist sites on the West Side.

Forests in the Planning Area east of the Cascade crest are typically comprised of a greater diversity of tree species (i.e., typically five or more species per stand) and size classes than the Planning Area forests west of the Cascade crest, which are generally represented by only one or two tree species

and greater uniformity in stand size structure. In the typical stands east of the Cascade crest it is relatively easy to maintain structural diversity and leave a diverse grouping of green-trees, including large, intermediates, and saplings, because of the multi-species components of the forest. In contrast, with the typically uniform stands west of the Cascades, limited tree species and size classes may restrict opportunities to create structural diversity.

The central and southern portions of the Eastern Cascade Province are dominated by mixed-conifer (grand fir, Douglas-fir, western larch, western white pine, lodgepole pine) and forests dominated by ponderosa pine at mid-to-lower elevations and by true fir (subalpine) at higher elevations. Forests in this region are highly fragmented due to poor soils, high fire frequencies, alpine meadows, and timber harvesting. At lower elevations and especially on south-facing slopes, dryness is a significant factor in the fragmentation of the forests. Wildfire has played a major role in shaping the forests in both the Eastern and Western Cascades Provinces. Recent efforts at fire suppression, especially in the Eastern Cascades, and selective timber-harvesting practices have resulted in shifts in tree species composition and forest structure in some areas. Late-successional forests, especially east of the Cascade crest, have become increasingly susceptible to catastrophic fires and epidemic attacks of insects and disease.

Although the forests east and west of the Cascade crest differ in terms of tree species composition and structure, adjacent high elevation areas on both sides of the crest are very similar and are comprised predominantly of Pacific silver fir forests. There are other similarities as well. For example, within the eastern-Cascade forests there are areas of relatively homogenous stands (i.e., lodgepole pine/ponderosa pine) which, like the Douglas-fir/western hemlock dominated stands in the western-Cascade forests, are prone to blowdown, disease, insects, and fire, which creates structural diversity and habitat for a wide array of animals. Approximately 8 percent of the Project Area and 12 percent of the Planning Area do not support commercial forests (e.g., lakes, rocks, etc.) and are referred to as non-forested areas.

The Planning Area is drained by two major river systems. The Yakima River and its tributaries drain the East Side and the Green River drains the West Side. There are a number of dams and reservoirs which have been constructed in the upper Yakima drainage. The Green River in the Planning Area is upstream of the Howard Hansen Dam, and Plum Creek's ownership in this area is interspersed amongst the Tacoma Municipal Watershed.

A description of other features of the area such as vegetative types, landform, slope, aspect, and parent material is presented in Jensen (1995). Current distribution of habitats and future projections are presented in Figures 46-48 and Table 30 and 30b of the HCP. Habitat categories for forested lands are defined and described in HCP Section 2.3.

Covered Activities

The incidental take permit would only authorize incidental take in connection with those aspects of commercial forest management considered in the HCP (including administration and monitoring, road access, road building and maintenance, site preparation, planting, thinning, fertilizing, pest and brush control, timber harvest, slash control, fire control, administrative and commercial road use,

administration and commercial use of gravel pits and rock quarries necessary for forest management, and administration and maintenance of all existing buildings, radio towers, and associated telecommunication facilities) and ecosystem-based forest planning on 169,177 acres of its ownership in the I-90 corridor of the central Cascades Mountain Range in Washington.

Summary of HCP Actions

The HCP includes commitments to provide certain amounts and types of habitats and stand structural classes. Timber harvest and road construction must be consistent with maintaining those habitat levels. In general, the HCP would not make silvicultural prescriptions outside of some minimal leave-tree requirements and a few situation-specific standards and guidelines pertaining to special habitats. It is a programmatic-style plan. Individual management units are not scheduled for harvest at any particular time and individual road locations and management are not specified. The HCP focuses on timber management as the primary landscape-influencing factor and the factor with the most influence on listed wildlife species. As long as Plum Creek's activities are consistent with the HCP, the proposed permit would provide a mechanism to authorize incidental take of listed species under Section 10 of the Act. In addition, under the HCP, Plum Creek would be required to comply with State forest practices rules and regulations throughout the Permit Period. While WAC 222-16-080-7(a) exempts activities covered under an HCP from the provisions of WAC 222-16-080, State rules and regulations such as road-construction standards and minimal leave-tree requirements are not intended to be supplanted as a result of implementation of the HCP.

In 1994, Plum Creek used even-aged harvesting techniques in approximately 17 percent of its harvest operations east of the Cascades crest, and in about 65 percent of its operations west of the Cascades crest. These harvesting techniques favor tree species, such as Douglas-fir, which grow best in open conditions with full sunlight. Shelterwood harvesting and other uneven-aged techniques favor shade-tolerant trees such as western hemlock. No predictions of the number of acres to be treated per decade are made herein because the HCP does not limit the amount of timber harvest so long as the required conditions are met. These are the major actions which will occur under the HCP. Other actions, such as road-building for access, are expected to be conducted in support of timber harvest and management.

"Mitigation measures" include actions taken by Plum Creek to avoid, minimize, and mitigate impacts to species addressed in the HCP. These actions include management actions as well as actions proposed to monitor and address impacts after implementation of the HCP. Mitigation in a multi-species, habitat-based plan is inextricably woven into the HCP itself. The following constitute some basic elements of the HCP. A majority of these actions contribute directly to the biological success of the HCP and are quantifiable. They also may constitute the measurable criteria (designated MC below) that Plum Creek will use to monitor and evaluate the biological success of the HCP. The Service only considered the mandatory elements in its evaluation of mitigation and resulting impacts. Some actions will be completed, or were completed, prior to implementation. Measures contained in the HCP to monitor and mitigate for impacts to listed species, as well as unlisted species, are:

Spotted Owl

- > Habitat Mapping (MC): Develop and implement a habitat-classification system to identify and map nesting/roosting/foraging (NRF), foraging/dispersal (FD) habitat, and non-habitat in the 418,690-acre Planning Area.
- > Habitat Monitoring (MC): Continue mapping of habitat conditions throughout the Permit Period.
- > NRF Maintenance (MC): Maintain target percentages for NRF habitat for each decade of the Permit Period (HCP Table 24), and at a minimum, maintain 8 percent of Plum Creek's ownership in the Planning Area as NRF habitat.
- > Prioritization: Develop a prioritization system to identify the most-productive owl sites and those with the highest likelihood for impact from Plum Creek actions.
- > NRF Deferrals (MC): Defer 2,600 acres of current NRF habitat from harvest for at least 20 years near key spotted owl sites in the Planning Area (HCP Section 3.2.1.1).
- > FD Corridors (MC): Retain 3,200 acres of current NRF and FD habitat as FD corridors to facilitate dispersal and linkage to additional habitat on Plum Creek and Federal lands (HCP Section 3.2.1.1)
- > Riparian Habitat Areas (MC): Maintain 5,600 acres of forestland adjacent to perennial streams as spotted owl habitat during the Permit Period.
- > Model and Deferral Validation Surveys: Conduct surveys in portions of the Planning Area to validate the model predictions of spotted owl habitat suitability during the Permit Period and the effectiveness of deferrals at selected spotted owl sites. This information will provide feedback into the adaptive-management provisions for owls. If observed levels within the sample areas are less than 80 percent of the projected levels, deferrals may be added, moved, or extended to remedy the situation.
- > Prey Surveys: Conduct surveys for spotted owl prey species in both the FD habitat and the Managed Old Growth structural stage to evaluate their function as spotted owl habitat.
- > Harvest Timing: Consider prioritizing owl sites, when entering owl sites to conduct harvesting operations, by first entering those stands with less biological value (i.e., unoccupied sites), and secondly, those stands furthest from an owl site center. An effort will be made to schedule harvests in a manner that will eventually contribute to larger patch sizes of mature forest.
- > Seasonal Protection: Prohibit timber harvest and road construction within a 0.25-mile radius of known owl sites from March 1 through August 31. Known owl sites would include sites discovered as a result of voluntary checks in likely management units.

Marbled Murrelet

- > Murrelet Surveys (MC): Use the criteria listed in HCP Section 3.2.1.2 to identify habitat parcels most-likely to be occupied on Plum Creek lands. Complete multi-year surveys to detect presence on 1,110 acres of potential murrelet habitat on Plum Creek and U.S. Forest Service ownership in the Planning Area by 1996. Protocol surveys will be performed on 853 acres of habitat, of which 224 acres are on Plum Creek ownership. HCP surveys will be performed on 257 acres of Plum Creek lands.
- > Murrelet Habitat Harvest Deferrals (MC): Defer timber harvest on 257 acres identified as the habitat most-likely to be occupied, until completion of surveys in 1996.
- > Murrelet Nest Site Protection (MC): Maintain the entire habitat block or a portion of the best 500 acres surrounding stands found to be occupied during Plum Creek's surveys. This protection will be maintained for the duration of occupancy and a minimum of 5 years after abandonment, as determined by protocol surveys in effect at that time.
- > Seasonal Protection: Prohibit timber harvest and road construction within a 0.25-mile radius of known murrelet sites from March 1 through August 31. Known murrelet sites would include sites discovered on Federal lands or future sites discovered on Plum Creek lands.

Grizzly Bear

- > Habitat Mapping/Assessment (MC): Map road densities, hiding/thermal cover, and forage/prey habitat to evaluate the quantity and quality of grizzly bear habitat on 115,462 acres in the Planning Area.
- > Habitat Monitoring (MC): Continue to assess and display habitat throughout the Permit Period.
- > Pre-verification Actions (MC): Implement a series of Best Management Practices (BMPs) to facilitate grizzly bear "recolonization" of the I-90 Lakes Subunit of the Planning Area including:
 1. Road closures. Restrict public use by installing gates.
 2. Road-density targets. Achieve a density of 1 mile of open road per section in I-90 Lakes Subunit during the first decade.
 3. Road location. Avoid sensitive areas such as wet meadows and avalanche chutes, and other areas identified in Watershed Analysis.
 4. Visual screening. Provide visual screening along open roads.
 5. Firearm prohibitions. Prohibit firearms in Plum Creek and contractor vehicles behind gates on closed roads except where job duties so require.

- > Upon-verification Actions (MC): Implement additional BMPs upon confirmation of grizzly bear residency in the I-90 Lakes Subunit of the Planning Area to reduce potential for death and displacement of resident bears including:
 1. Additional road closures. Provide additional road closures as necessary.
 2. Road location and construction. Implement specific actions outlined in HCP Section 3.2.1.3 to benefit grizzlies.
 3. Visual screening. Provide cover adjacent to preferred habitats.
 4. Size of openings. Configure harvest units such that no point is more than 600 feet from effective hiding cover.
 5. Timing of operations. Coordinate activities in time and space so as to minimize disturbance to bears.
- > Temporary Measures: Implement temporary closures and measures to minimize conflicts in the event of detections inside and outside the Recovery Zone.

Gray Wolf

- > Den Site Protection (MC): Restrict forest-management activities within a 0.25-mile radius of an active den site during the denning period (April 1 - June 15); coordinate all activities within a 0.5-mile radius of an active den site with the Service; defer harvest in management units with a den site for up to 2 years; and consider additional road closures.
- > Provision of Prey: Monitor and report habitat amounts for Lifeform 5.
- > Road Management: Continue cooperative road closures in important ungulate areas.
- > Timing of Operations: Schedule activities to avoid disturbance.

Bald Eagle

- > Bald Eagle Management Plans: Develop cooperative site-management plans with the WDFW for bald eagle nest sites which may occur near Plum Creek's ownership during the Permit Period. Site-management plans will consider associated feeding sites and pilot trees, and disturbance of winter feeding concentrations and communal roost sites will be avoided.

Peregrine Falcon

- > Peregrine Falcon Protection Plans: Implement steps outlined in the Pacific Coast Recovery Plan for the American Peregrine Falcon (U.S. Fish and Wildlife Service 1982) to address forest-management activities near peregrine falcon nests which may occur on or near Plum Creek's lands during the Permit Period. Protocol surveys (Pagel 1992) will be conducted prior to conducting activities near likely aerie sites.

Other Species

- > Goshawk Nest Protection (MC): Defer harvest of 274 acres of habitat currently supporting 6 goshawk sites on Plum Creek's land for at least 20 years (HCP Section 3.5.2.4).
- > Goshawk Nest Avoidance (MC): Defer activities within 0.25 miles of known goshawk nests between March 1 and August 31.
- > Forest Stand Structure Classification: Develop a stand-level classification system which integrates timber-inventory parameters with wildlife-habitat components for 8 structural classes, ranging from stand initiation to old-growth forests (Oliver et al. 1995). The stand structure classes are as follows: Stand Initiation, Shrub/Sapling, Young Forest, Pole Timber, Dispersal Forest, Mature Forest, Managed Old Growth, and Old Growth.
- > Structural Stage Diversity (MC): Maintain a diversity of forest structural stages through the Permit Period to provide primary and secondary habitat for 16 Lifeforms (HCP Table 26).
- > Breeding Bird Surveys: Conduct breeding-bird surveys at designated intervals during the Permit Period to verify associations of various Lifeforms to stand-structural classes developed for the HCP.
- > Amphibian Surveys: Conduct amphibian surveys at designated intervals during the Permit Period to evaluate the success of riparian-management practices in providing habitat and protecting conditions for amphibians and provide feedback into the adaptive-management process.

Riparian Management

- > Ecological Classification: Complete a hierarchical ecological classification of the Planning Area which incorporates geomorphology and hydrologic data necessary for watershed analysis (Jensen 1995; HCP Section 2.1).
- > Watershed Analysis (MC): Accelerate watershed analysis in 20 watersheds in the Planning Area. Evaluations, subject to SEPA review, will be submitted within 5 years following issuance of the Permit. Prescriptions will be upgraded as necessary. Watershed analysis will provide feedback into riparian strategies through adaptive management (Toth 1995, Technical Report 11; Toth et al. 1995).
- > Riparian Habitat Areas (MC): Manage 10,900 acres of forest adjacent to perennial streams according to Forest structural classes projected in HCP Table 30. The minimum widths and restrictions are as follows:
 1. Fishbearing streams -- Maintain 200-foot Riparian Habitat Area (RHA) with 30-foot, no-harvest/no-equipment zone. Harvests may remove up to 50 percent of volume only when consistent with retention of characteristics needed for foraging and dispersal habitat for owls.

Retained timber will be "feathered" (i.e., more trees left near stream). Yarding will be avoided across fishbearing streams as much as possible.

2. Sensitive perennial streams -- Identify perennial streams below 5,000 feet in LSR or AMA or upstream of bull trout, salmon, or 303(d) listed waters in the Yakama River System. Establish 100-foot RHA with 30-foot no-equipment buffer. Harvests may remove up to 50 percent of volume only when consistent with retention of characteristics needed for foraging and dispersal habitat for owls. Retained timber will be "feathered" (i.e., more trees left near stream). Yarding will be limited to 20 percent of reach and will not remove wood from the riparian corridor itself.

3. Other perennial streams -- Establish 25-foot Riparian Leave Tree Area (RLTA) or alternative clumping along the first 2,000 feet or more from a junction with a fishbearing stream. Other perennial streams not discussed above may not receive a buffer unless they occur on unstable slopes, inner gorges, or other areas identified for special treatment in watershed analysis.

- > 303(d) Harvest Deferrals (MC): Defer harvest on all riparian forest adjacent to stream segments listed as water-quality limited (667 acres) until completion of watershed analysis.
- > Aquatic Resources Monitoring: Identify and monitor stream reaches in key watersheds on Plum Creek land to evaluate aquatic habitat conditions and fish populations at periodic intervals over the Permit Period.

Special Habitats

- > Wetlands (MC): Follow specified wetland-management zones and operational restrictions for 1,050 acres of forestlands adjacent to wetlands on Plum Creek ownership in the Planning Area. These include expanded buffers on larger wetlands, no-equipment buffers, more-robust leave-tree specifications, only 1 entry per rotation, and retention of canopy cover in forested wetlands.
- > Snags/Snag Recruitment Trees (MC): Retain an average of 3 snags per acre in even-aged management units to support Lifeforms dependent upon dead and defective trees for breeding and feeding habitat. Where snags are lacking, additional green recruitment trees will be left instead. Retain at least 3 green recruitment trees per acre harvested. Larger and/or hollow snags will be given priority for retention. Green-recruitment trees will be either dominants or codominants. Clumping and scattering of leave trees will both be utilized.
- > Talus Slopes (MC): Retain large green trees and snags within 100 feet of talus slopes to maintain shade, coarse woody debris, and habitat for wildlife species associated with talus slopes. Operational restrictions around talus slopes will also be implemented.

- > Caves (MC): Managed. forested buffers will be left for a minimum of 100 feet from cave entrances to protect bats and other species of wildlife. Site-specific mapping and analysis may yield additional actions to protect integrity of cave passages.
- > Seeps: Use directional felling, avoid skidding and yarding, prohibit ground-based equipment, and retain residual trees within 25 feet of seep.
- > Mineral Springs (MC): Coordinate activities within 200 feet to provide mast- and berry-bearing plants and use directional felling.
- > Ponderosa Pine Stands: Use uneven-aged, multi-story management and snag retention as much as practicable.

Road Management

- > Minimizing Construction: Reduce road construction where economically and operationally possible by using other harvesting systems (e.g., cable yarding, helicopters).
- > Closures/Abandonment: Close or abandon ("decommission") roads where feasible to address watershed concerns and habitat requirements for grizzly bears, wolves, and other species included in the HCP.

Research, Monitoring, and Reporting

- > Monitoring and Reporting: Monitor the criteria described in HCP Section 5.1 annually for the Permit Period and provide reports to the Services at years: 2, 5, 10, 15, 20, 30, 40, and 50, and at 10-year intervals during Phase II. The complete schedule of monitoring and reporting is presented in HCP Table 31. Monitoring will include the following types:
 1. Implementation monitoring -- Ensure plan is being implemented by sampling harvest units with post-harvest cruises and assessment of whether required actions and parameters are being properly conducted and achieved.
 2. Habitat monitoring -- Track and report stand-structure classes, amounts, and distribution of habitats.
 3. Owl monitoring -- Sample areas will receive periodic surveys and demographic checks to ensure population is within predicted bounds, deferrals are functioning, and to acquire information about productivity and persistence of sites.
 4. Owl prey monitoring -- Verify value of FD habitat and Managed Old Growth structural stage as foraging habitat by evaluating the presence of a small-mammal prey-base for resident owls.
 5. Breeding bird monitoring -- Verify lifeform orientations and habitat associations of bird species.
 6. Amphibian monitoring -- Evaluate and adjust Riparian Management Strategy using feedback from stream-reach surveys and time-constraint surveys.

7. Aquatic monitoring -- Several different types of monitoring will be conducted in addition to the monitoring occurring as a result of watershed analysis:

- a. Effectiveness: Assessments of sediments and substrates, channel morphology, large-woody debris, and similar parameters.
- b. Water temperature: Analysis of the effects of various riparian management strategies on stream temperature.
- c. Invertebrate indicators: Assessment of the biological integrity of streams by monitoring composition and abundance of aquatic insect species in the Little Naches River and Cabin Creek.
- d. Fish populations: Assessment of fish populations in the context of recovery of habitat conditions in Cabin Creek.

- > Research: HCP Section 5.4.4, Research Program, describes the research anticipated to address the current gaps in knowledge necessary to support the adaptive-management approach.

Other Measures

- > Forest Inventory: Revise inventory procedures to incorporate measurement of wildlife-habitat characteristics (e.g., snags, structural class) necessary to evaluate and monitor success of the HCP. The inventory schedule will be accelerated in the Planning Area to obtain more-precise information on more acres of company ownership. Results of initial efforts will be presented in the 2-year report.
- > Environmental Principles: Continue to employ Plum Creek's Environmental Principles (HCP Appendix 2), as they may be amended from time to time, to address aesthetic and environmental issues in the Planning Area. Implementation of the Environmental Principles typically involves implementing practices in excess of State Forest Practices Rules and Regulations.
- > Employee/Contractor Training: Facilitate implementation of the HCP by conducting training programs for all professional foresters, engineers, scientists, and contractors. The program will train all employees and contractors involved in forest management in state-of-the-art techniques to integrate the management of all forest resources, and familiarize them with the details of the HCP along with the Company's plans, policies, and programs to implement the HCP.

Assumptions

During the HCP development and during the assessments of impacts conducted in association with the HCP, a number of assumptions were necessary. It was assumed that all Plum Creek lands are, or will be, accessible and available for harvest by road (HCP Section 1.8). It was assumed that access requests would be granted by the U.S. Forest Service where road access to Plum Creek lands does not currently exist. However, site-specific analyses of such access requests across Federal land will be completed on a project-by-project or aggregated basis and be subject to National

Environmental Policy Act (NEPA) review and additional consultation under Section 7. The Service assumed that timber management and harvest by the U.S. Forest Service would occur within Late-successional Reserves and in Adaptive Management Areas in accordance with the Northwest Forest Plan, although the analysis in this opinion also considers the effects of harvesting some additional sales required to be released by the Rescissions Act, as interpreted by Federal courts. The Service obtained information from the U.S. Forest Service upon which to base estimates of the types and amounts of harvest possible under management plans developed for the Snoqualmie Pass Adaptive Management Area, Late-Successional Reserves, and plans designed to reduce the risk of catastrophic fire. The HCP (Section 2.6.5) analyzed two possible scenarios which yielded similar results. Additional impacts of such Federal actions, however, will also be subject to additional NEPA and Section 7 review.

Flexibility and Amendments

The Service also anticipates that Plum Creek will exercise flexibility in the conduct of this HCP. For instance, stand-structure amounts are allowed to vary within prescribed limits. The Service analyzed the impacts to species associated with the lower amounts of habitat. The attached Table 1 depicts the impacts to habitat amounts and species (by Lifeform).

The HCP maintains the ability for Plum Creek to institute minor changes to the HCP upon consultation with the Services such as changing locations of or adding owl deferrals, changing boundaries of owl-survey areas, or conducting actions between 0.25 and 0.5 miles of a wolf den outside the denning season. Adaptive management is another mechanism for change. Results from the monitoring and research program may indicate that additional conservation is required, and the HCP provides enough flexibility to incorporate such knowledge into revised prescriptions. Amendments may be proposed by either the Services or Plum Creek at any time during the Permit Period. These amendments may be treated as minor changes or material amendments depending on the Services assessment of the level of change and impact (IA Section 7.3.2).

The HCP assumed that some level of land exchange was possible and, as such, provided various mechanisms to incorporate such exchange (HCP Section 5.3.4). Exchanges or disposition may be made to private, State, or Federal entities and will be subject to the provisions of the IA and HCP to ensure the integrity of the HCP is maintained. The Service would expect to prepare an addendum to the HCP describing any such changes in survey areas, ownership, deferral locations, or changes made to prescriptions, definitions, or site-specific actions where such changes are not material to the functioning of the HCP.

As specified in the IA, should any of the currently unlisted species subsequently become listed, Plum Creek may request an amendment to the incidental take permit to include such vertebrate species. If an amendment request is received, the Service and/or NMFS will reinitiate consultation under Section 7 of the Act and initiate amendment of the HCP. Such an amendment will: (1) present relevant existing information on the status, trend, or other information pertinent to the Planning Area; (2) estimate the amount of take and the impacts of such take; (3) describe the ongoing minimization and mitigation steps the applicant is taking or will take relative to that species; (4) describe any additional actions that were found to be necessary or appropriate to successfully

complete an amendment for that species; and (5) explain how each of the issuance criteria described in Section 10 (2)(B) are being met. Such amendment should cite the Federal Register documents used in proposed, emergency, or final listing; cite any pertinent draft recovery plan effort or similar management plans for the species or its habitats; and must consider the other obligations of the Services as Federal agencies. It is expected that, upon listing of a currently unlisted species, additional information will be available in any proposed, final, or emergency listing to determine the habitat and life-history requirements of the species, the range-wide status, threats to the species, applicable management recommendations, and other basic information necessary to complete the amendment and reinitiation processes. Before such species would be added to the permit, the Service must find that adding the species to the permit would not appreciably reduce the likelihood of survival and recovery of the affected species in the wild and would be consistent with its other responsibilities.

Upon termination of the 50-year Phase I, the permit may extend for an additional 50 years for certain species or habitats. This extension (Phase II) is described more fully and the impacts of Phase II are analyzed in HCP Section 5.3.3. The ability to extend the permit into Phase II of this project provides Plum Creek with incentives to provide additional habitats voluntarily. If Phase I is completed, this provision will ensure that, for species to be covered by this "Safe Harbor" provision, conditions will be maintained at levels above that anticipated for year 50. If Phase I is not fully completed, Phase II would not be granted unless conditions exceed the higher of today's condition or that predicted to occur at year 50. This establishes a very high threshold that provides an additional incentive to complete Phase I of the permit. During Phase II, applicable provisions of the HCP will apply and take-minimization efforts will be employed. Some provisions will only apply during Phase I, and others would apply in Phase II if the species being covered are dependant on the habitat types or actions involved. Some actions are more likely to occur in Phase II than others. For instance, habitat-amount commitments in RHAs are very likely to continue regardless of the species involved; whereas minimization of road building would depend heavily upon the species involved. If a cave-dependant species were listed on the permit during Phase II, then protection of caves as specified in the HCP must continue as well. Concurrent with the 40-year report, Plum Creek will submit a request identifying the species for which it desires to implement Phase II provisions. The IA provides the Service with an opportunity to assess whether Phase II would be warranted.

In the event that a change to the HCP is deemed desirable or necessary by the Services, they will have the following opportunities to effect change (presented in hierarchal order of urgency):

1. Request Plum Creek to avail itself of the HCP flexibility.
2. Utilize, where applicable, the provisions for consultation with the Services.
3. Utilize, where applicable, the adaptive-management process.
4. Propose either minor changes or material amendments.
5. Seek additional mitigation from nearby Federal lands.
6. Require redistribution of conservation measures as a result of extraordinary circumstances.
7. Terminate permit with respect to that species, where necessary, to avoid appreciably reducing the likelihood of survival and recovery of the species in the wild.

In the case of extraordinary circumstances, the Service must first seek mitigation from Federal lands, and only where protective measures on Federal lands are insufficient, may it impose additional mitigation upon Plum Creek.

Covered Species

The HCP considered and some provisions of the IA address all vertebrate species which may use the habitats which are present within the Planning Area. These vertebrate species include not only the 285 known vertebrate species inhabiting the area which were specifically named and addressed in the HCP and its supporting technical papers, but additional species as well.

The listed species which would be covered by the currently proposed permit include the northern spotted owl, the marbled murrelet, the gray wolf, and the grizzly bear. The IA describes the process by which additional vertebrate species may be added to the permit in the future. This biological opinion only considers listed species. Should additional species become listed, or should Plum Creek request that the bald eagle or peregrine falcon be added to the permit, reinitiation would be necessary. In that event, reinitiation should be facilitated by this biological opinion, the HCP, the Section 10 findings, and any applicable recovery plan or notice of listing.

STATUS OF THE SPECIES (rangewide)

NORTHERN SPOTTED OWL

The history of owl management and owl-management plans is briefly presented in Section 1.4 of the HCP. For a detailed discussion of the biology and status of the species, refer to the 1990 Status Review (USDI 1990a), the final rule listing the spotted owl as threatened (USDI 1990b; 55 FR 26114), the final rule designating critical habitat (USDI 1992a; 57 FR 1796), the Interagency Scientific Committee (ISC) report (Thomas, et al., 1990), the Scientific Analysis Team (SAT) report (Thomas et al. 1993) the final draft Recovery Plan for the Northern Spotted Owl (USDI 1992c), the Forest Ecosystem Management: An Ecological, Economic, and Social Assessment (Report of the Forest Ecosystem Management Assessment Team) (FEMAT)(USDA et al. 1993), Spotted Owl Habitat in Washington: A Report to the Washington Forest Practices Board by the Spotted Owl Scientific Advisory Group (SAG)(Hanson et al. 1993), the Proposed 4(d) Special Rule (USDI 1995a; 60 FR 9484), the supporting documents for the Northwest Forest Plan (NWFP)(USDA/USDI 1994 a and b), and biological opinions for the U.S. Forest Service's Region 6 pre-Section 318 (USDI 1990c) and Section 318 (USDI 1990d) timber sale programs.

Interagency Scientific Committee Report

The Interagency Scientific Committee (ISC), headed by Jack W. Thomas, in 1990 (Thomas et al. 1990) identified various geographic units termed Habitat Conservation Areas (HCAs) which were thought to be capable of supporting owl pairs. The HCAs were divided into two categories: Category 1 HCAs included habitats capable of supporting 20 pairs of owls; and Category 2 HCAs included habitats capable of supporting 2 to 19 pairs of owls. Under this context, intervening habitat

between HCAs was given management consideration for dispersal habitat and connectivity, which resulted in the development of the "50-11-40 rule" (i.e., timber harvesting on Federal lands shall be permitted when more than or at least 50 percent of the forest landscape consists of forest stands with a mean diameter at breast height (DBH) of 11 inches and a canopy closure of 40 percent).

Final Draft Recovery Plan

A final draft Recovery Plan (USDI 1992c) was prepared. As a primary means for achieving recovery of the spotted owl, the final draft Recovery Plan recommends establishing 192 Designated Conservation Areas (DCAs) to provide more than 7.6 million acres of Federal forest lands as the primary habitat for the northern spotted owl. The DCA network represents approximately 46 percent of the total remaining spotted owl nesting, roosting, and foraging (NRF) habitat on Federal lands. As of December 1992, the DCAs contained 1,445 known owl pairs on Federal lands, or about 51 percent of the total pairs known on all Federal lands (USDI 1992c). The final draft Recovery Plan concluded that when the DCAs become fully developed owl habitat, they will contain habitat sufficient to support a population of approximately 2,340 owls (USDI 1992c). The DCAs were derived from and were intended to replace the HCAs proposed by Thomas et al. (1990). The overall objective of the re-mapping was to provide a level of protection in DCAs at least as high as that provided by the HCAs, while increasing the biological and economic efficiency of the network and effectively providing protection of habitat for other species. The DCA network remedied many of the deficiencies that had been identified in the old HCA network. The final draft Recovery Plan also recommended a broad landscape approach to spotted owl protection, covering 7.6 million acres of Federal forestland as primary habitat for the spotted owl, with 53 Category 1 DCAs and 139 Category 2 DCAs. The final draft Recovery Plan adopted the HCA Category 1 and Category 2 convention of Thomas et al. (1990) for DCAs. However, some of the Category 2 DCAs were designed to support only a single pair of owls (USDI 1992c).

Scientific Advisory Group

On December 20, 1993, the Washington Forest Practices Board Spotted Owl Scientific Advisory Group issued its final report. That report, among other tasks, identified functional habitat types, determined Physiographic Provinces among which habitat definitions differ, quantitatively described each type of owl habitat for each province, and described important nonfederal landscapes and recommended conservation functions.

Forest Ecosystem Management Assessment Team and the Northwest Forest Plan

The next phase in spotted owl management was the formation of the Forest Ecosystem Management Assessment Team (FEMAT) in 1993. FEMAT was an interagency, interdisciplinary team of experts which produced a report assessing 10 options for management of Federal forests within the range of the spotted owl. President Clinton announced his proposed Forest Plan on July 1, 1993, which was analyzed in a Draft Supplemental Environmental Impact Statement (Draft SEIS). The Final SEIS was made available to the public in February 1994. The Record of Decision issued in April 1994 provides for an integrated reserve system based largely on the protection of habitat within multiple-purpose watersheds. Concepts such as Late-Successional Reserves and Riparian Reserves

were incorporated to assure the viability of threatened and at-risk species, and Adaptive Management Areas evolved to test technical and social objectives associated with the overall strategy of ecosystem management. Further, the President's Forest Plan (now known as the Northwest Forest Plan) allocated more than 24 million acres of Federal lands into six designated categories (i.e., Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, and Riparian Reserves) and one non-designated category referred to as Matrix. The Northwest Forest Plan is summarized in HCP Section 1.5.1.

Critical Habitat and Proposed 4(d) Special Rule

On January 15, 1992, (57 FR 1796)(USDI 1992a) the Service designated 6,887,000 acres of spotted owl critical habitat, solely on Federal lands. This designation provided additional protection to the species. Additional information regarding current status of this species was presented in the February 17, 1995, Federal Register document (60 FR 9484)(USDI 1995a) which proposed a special rule under Section 4(d) of the Act in recognition of the contribution made by the Northwest Forest Plan. The proposed special rule would replace current guidelines and prohibition from take with a geographically specific set of standards that reduce prohibitions applicable to timber harvest and related activities on specified nonfederal forest lands in Washington and California.

Habitat Definitions

At least three paradigms have been used previously in Washington to describe spotted owl habitat since the Federal listing of the species in 1990. One of the first descriptions of spotted owl habitat was the use of "suitable" and "non-habitat" as defined in the draft Recovery Plan (USDI 1992a). Other descriptions used "A," "B," and "C" habitat types which equated to optimal, suitable, and marginal habitat for spotted owls (Washington Department Natural Resources' Owl Memo #3; March 5, 1991). More recently, the spotted owl Scientific Analysis Group (SAG) developed a habitat nomenclature based on "Old," "Submature," and "Young Forest Marginal" definitions (Hanson et al. 1993). Among these three paradigms, the A/B/C habitat definition has been used most widely due to its adoption in State Forest Practices Rules and Regulations.

Demography

As of July 1, 1994, there were 5,431 known locations, or site centers, of northern spotted owl pairs or resident single owls in Washington, Oregon, and California (USDI 1995a). Currently, 1,319 owl site centers are located on nonfederal lands. In Washington, 140 of 851 sites were located on nonfederal lands. In addition to the site centers located on nonfederal lands, preliminary analysis indicate that there were 151 site centers in Washington located on Federal lands that are dependent upon some percentage of suitable owl habitat on adjacent nonfederal lands. Nonfederal lands in certain portions of the owl's range are still necessary to support and supplement the Federal lands-based owl conservation strategy. As of October 1994, 1113 sites were documented in Washington, including 348 sites in the Eastern Cascades and 492 sites in the Western Cascades (WDNR 1995).

Demographic information is still lacking to reliably project a population trend. Much of the available data and many models suggest that the population may be declining; however, juvenile emigration data is only available at a small number of study sites and a number of biases may cause over or under estimates of population trends which make exact estimates uncertain (E. Forsman, U.S. Forest Service -- Pacific Northwest Research Station, pers. comm., 1996). However, the most widely cited data indicate the population is declining and that the rate of decline is accelerating (Burnham et al. 1994).

MARBLED MURRELET

An account of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet is found in the 1988 Status Review (Marshall 1988), the final rule designating the species as threatened (USDI 1992b), the Service's biological opinion for Alternative 9 (USDI 1994b) of the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA/USDI 1994a) (FSEIS), the Ecology and Conservation of the Marbled Murrelet (Ralph et al. 1995), the final rule designating critical habitat for the species (May 24, 1996 Federal Register; 61 FR 26225)(USDI 1996), and the draft Recovery Plan (USDI 1995).

A draft Recovery Plan has been developed and is currently being finalized by the recovery team. In the immediate future, the draft Recovery Plan recommends that: (1) All occupied habitat be maintained and protected; (2) That the loss of unoccupied, but suitable habitat, be minimized; (3) potential and suitable habitat be maintained in larger contiguous blocks; and (4) that historic distributions be maintained. The recommendations for the long-term include increasing the amount and quality, as well as the distribution, of habitat available for nesting. One of the mechanisms proposed to meet these objectives is the development of HCPs. The Draft Recovery Plan also identified six marbled murrelet conservation zones, which were described based on common management issues. The Puget Sound Marbled Murrelet Conservation Zone (Zone 1) extends 50 miles inland from the Puget Sound. The draft plan identifies essential nesting habitats that occur on nonfederal lands in Washington State within 40 miles of the coast. The Service has designated critical habitat on the west side of the Cascade Crest in Washington (USDI 1996).

The marbled murrelet population in Washington has been estimated at 5,000 individuals (Speich et al. 1992) based on surveys in the early 1980's. In Zone 1, the population is approximately 2,600 individuals, although the Speich et al. (1992) population estimate does not correspond exactly with the Zone. In Zone 1, there are 213 known occupied sites (WDFW, Nongame database 1995). These are mostly associated with or in the immediate vicinity of marine habitat in north Puget Sound and Hood Canal. In south Puget Sound, known occupied sites are few and the acreage of suitable marbled murrelet habitat is limited. If all "suitable" habitat in a 0.5-mile circle around known occupied sites is considered to be occupied, there are 18,478 acres of known occupied habitat in Zone 1. "Suitable" habitat is defined as old growth mapped by WDFW (Eby and Snyder 1990). Approximately 522,500 acres of "suitable" habitat are present in Zone 1 under this definition. However, several potential sources of error exist, which affect the estimates of old growth. Most importantly, this evaluation overestimates suitable nesting habitat for marbled murrelets, since not

all old growth as mapped by Eby and Snyder (1990) is actually suitable murrelet habitat. There may also be habitat that was not identified as Old Growth. The State of Washington Department of Natural Resources (DNR) has established regulations which address murrelets and murrelet habitat on private land. The DNR defines potential murrelet habitat as stands with 8 or more residual trees that exceed 32 inches in diameter. This was based on the recommendations of the Scientific Advisory Group (Cummins et al. 1993) which offered several options for other criteria. The furthest areas considered from marine waters was 52.25 miles and the smallest stands considered were larger than 5 acres. This differs from the Service's definition, but is consistent with the criteria used in the HCP.

GRIZZLY BEAR

A detailed account of the taxonomy, ecology, and reproductive characteristics of the grizzly bear is presented in the Grizzly Bear Compendium (LeFranc et al. 1987) and the Grizzly Bear Recovery Plan (U.S. Fish and Wildlife Service 1993).

The grizzly bear was federally listed as threatened on July 28, 1975 (USDI 1975). Grizzly bear populations in the lower 48 States had receded from estimates of over 50,000 to less than 1,000 grizzly bears between 1800 and 1975. Habitat loss, and direct and indirect human-caused mortality is related to their decline in numbers. The grizzly bear was originally distributed in various habitats throughout western North America from Central Mexico to the Arctic Ocean. The current distribution of the grizzly bear south of Canada has been reduced to five, possibly six, ecosystems within four states, which equates to less than 2 percent of its former range. One of the ecosystems where the grizzly still exists is the North Cascades of Washington.

A Grizzly Bear Recovery Plan was approved on January 29, 1982, and a revised plan was completed on September 10, 1993 (U.S. Fish and Wildlife Service 1993). The Grizzly Bear Recovery Plan established six recovery zones with the overall objective to de-list the grizzly bear in each of the zones as bears within each zone achieved recovery targets.

The North Cascades Recovery Zone consists of 9,565 square miles and extends from the Canadian border in north central Washington south to Interstate 90. It includes all of the North Cascades National Park Service Complex; the Mount Baker-Snoqualmie National Forest and Wenatchee National Forest north of Interstate 90; and the Okanogan National Forest west of the Okanogan River. This recovery zone is contiguous to an area of low grizzly bear density in Canada. Verified grizzly tracks have been documented in the north Cascades, and a 6-year study indicated that sufficient amounts of quality habitat exists to sustain a viable population of grizzly bears in the North Cascades (J. Haas, U.S. Fish and Wildlife Service -- Western Washington State Office, pers. comm., 1996). For additional information concerning the status and biology of the species, refer to the Grizzly Bear Compendium (LeFranc et al. 1987).

GRAY WOLF

A detailed account of the taxonomy, ecology, and reproductive characteristics of the gray wolf is presented in the Northern Rocky Mountain Wolf Recovery Plan (U.S. Fish and Wildlife Service 1987), and The Gray Wolf: History, Present Status and Management Recommendations (Kaminski and Boss 1981).

The gray wolf was federally listed on March 9, 1978 (USDI 1978b). It is listed as endangered in the 48 conterminous States, except Minnesota where it was listed as threatened. The listing was based on a nationwide population decline as a result of land development, loss of habitat, poisoning, trapping, and hunting. Current populations of the gray wolf in the West are mostly confined to small areas in central Idaho, western Montana, and extreme northwestern Wyoming. A Northern Rocky Mountain Wolf Recovery Plan was completed on August 3, 1987 (U.S. Fish and Wildlife Service 1987). The goal of the Recovery Plan was to re-establish the gray wolf in portions of its former range in the Northern Rocky Mountains. Wolves also persist or are becoming re-established in the North Cascades of Washington. However, there is no recovery plan for the wolf in the Pacific Northwest States. The Service is currently involved in the development of a range-wide wolf recovery strategy. Wolf-management guidelines have been developed to serve in the interim.

BALD EAGLE

A detailed account of the taxonomy, ecology, and reproductive characteristics of the bald eagle is presented in the Pacific States Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service 1986), and the final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 States (USDI 1995d).

On February 14, 1978, the bald eagle was federally listed throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (USDI 1978a). The listing was a result of a decline in the eagle population throughout the lower 48 States. The decline was largely attributed to the wide-spread use of DDT and other organochlorine compounds. DDT was discovered to accumulate in individual bald eagles after ingesting contaminated food which eventually impaired calcium release for egg shell formation, thus inducing thin shells and reproductive failure. In the 17 years since it was listed, the bald eagle population has improved nationwide as a direct result of the ban of DDT and other persistent organochlorines and from recovery efforts. The species has been doubling its breeding population every 6-7 years since the late 1970's. As a result of the improved bald eagle population, the Service has reclassified the bald eagle from endangered to threatened in the lower 48 States (USDI 1995d).

PEREGRINE FALCON

A detailed account of the taxonomy, ecology, and reproductive characteristics of the peregrine falcon is presented in the Pacific Coast Recovery Plan for the American Peregrine Falcon (U.S. Fish and

Wildlife Service 1982). and the Advanced Notice of a Proposal To Remove the American Peregrine Falcon from the List of Endangered and Threatened Wildlife (Federal Register, June 30, 1995; 60 FR 34406)(USDI 1995b).

Due to population declines of American peregrine falcons, the Service, in 1970, listed this subspecies as endangered under the Endangered Species Conservation Act of 1969. The subspecies was subsequently listed under the Endangered Species Act of 1973, as amended. During the period of DDT use in North America, shell thinning and nesting failures were widespread in peregrine falcons, and in some areas successful reproduction virtually ceased. DDT was discovered to accumulate in individual falcons after ingesting contaminated food which eventually impaired calcium release for egg shell formation, thus inducing thin shells and reproductive failure.

Recently, the population has improved as a direct result of the ban of DDT and other persistent organochlorines and from recovery efforts. As a result of the improved population, the Service has published in the June 30, 1995, Federal Register (60 FR 34406), an advanced notice of a proposed rule to remove the American Peregrine Falcon from the list of endangered and threatened wildlife.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have undergone Section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress. Such actions include, but are not limited to previous timber harvests and other land-management activities, including the adoption of a late-successional forest management strategy known as the Northwest Forest Plan (USDA et al. 1994a, 1994b). FEMAT (USDA et al. 1993), the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA 1994a) (FSEIS), the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA et al. 1994b) (ROD), and the biological opinion on the FSEIS preferred alternative (USDI 1994b) also provide information relevant to addressing the environmental baseline for this action.

Past land-management activities have degraded owl and murrelet habitat conditions throughout the range of these species; the Northwest Forest Plan was developed to address the conservation of these and other species. The basic conservation strategy in the Northwest Forest Plan builds upon the measures developed by the ISC (Thomas et al. 1990) and the northern spotted owl recovery team (USDI 1992c). The Northwest Forest Plan provides for the protection of extensive forest reserves in Federal ownership which currently support, or have the potential to support, large reproductively viable owl population clusters throughout the range of the species. No new timber sales will be planned in federally owned forested stands known to be occupied by marbled murrelets regardless of whether these stands occur in reserves, adaptive management, or matrix areas. In addition, the

system of LSRs will not only protect habitat currently suitable to murrelets, but also develop future habitat in large blocks.

When the Northwest Forest Plan is implemented as originally designed and intended, Federal lands are expected to carry the major burden of conservation and recovery of late-successional habitats and associated species such as the murrelet and owl. While contributions from nonfederal land remain important in many areas, proper implementation of the Northwest Forest Plan would allow greater flexibility in the management of these nonfederal lands.

On July 27, 1995, the President signed the 1995 Rescission Bill (P.L. 104-19). Section 2001(k) of this law directed the Secretaries of Agriculture and Interior to allow the harvest of certain timber sales for which contracts were "*offered or awarded before [July 27, 1995] in any unit of the National Forest System or district of the Bureau of Land Management subject to section 318 of Public Law 101-121 (103 Stat. 745).*" The vast majority of these timber sales were developed in accordance with Section 318 of P.L. 101-121, the Fiscal Year 1990 Interior and Related Agencies Appropriations Act. Most have been harvested during the last 5 years, but several sales have not been harvested due to compliance with various environmental laws.

The fate of sales that may be affected by P.L. 104-19 is uncertain at this time. Multiple issues related to the Rescission Bill are currently in litigation so the Service is unable to fully analyze how implementation of this Bill may affect the environmental baseline for this action.

In particular, there is uncertainty regarding which sales would go forward under section 2001(k). The Departments of Interior and Agriculture issued policy direction to the U.S. Forest Service and the Bureau of Land Management (BLM) regarding the scope of section 2001(k). A letter, dated August 22, 1995, directs the U.S. Forest Service and BLM to interpret Section 2001(k) of P.L. 104-19 as applying only to sales in Oregon and Washington that were subject to the ecological and procedural criteria provided in section 318(b)-(j) of P.L. 101-121. Timber industry representatives disagreed with this interpretation and sued the Secretaries, claiming that the reference to section 318 was used to define the geographic scope of Section 2001(k), and that the government should release all previously offered or awarded sales within the geographic scope of Section 318. On September 13, 1995, Judge Michael Hogan of the U.S. District Court for the District of Oregon decided in plaintiff's favor.

There are no "Rescission-Bill" or "318" sales in or near the Planning Area. However, a number of such sales have been or are likely to be harvested within the ranges of the 6 affected listed species as a result of this ruling.

On the Mount Baker/Snoqualmie National Forest, there are a total of 7 sales: Sibley; Flash Gordon; Skookum Doe; Dry Ranger; H-410-S.W., #255; and two other unnamed sales. These sales are "nonmurrelet" sales and have never been marked or cut, and may not have been part of the recent legislation.

On the Wenatchee National Forest, there are two sales, Tip and Tip-Top. These sales total 420 acres and are designed to be consistent with the NWFP. They may provide foraging habitat for bears and wolves, but are not habitat for the other 4 species.

On the Gifford Pinchot National Forest, there are 3 sales: Silver 7; Polar 2; and Holdaway 2. No information is available regarding the first 2 sales. Holdaway 2 is expected to result in the removal of 37 acres of late-successional/old growth forest. It may result in the take of up to 2 pairs and 1 resident owl, it is not likely to adversely affect wolves and bears and does not provide habitat for eagles or falcons.

On the Okanogan National Forest, Nicholson Salvage 1 has modified about 1,000 acres of potential wolf habitat which may also provide marginal grizzly bear habitat.

On the Colville National Forest, only 1 possible sale is noted: Gaterson. Although this is a relatively large sale as originally proposed, the Service is uncertain of its status. Although it may effect bears or wolves to some degree, this sale is far removed from the project area and is outside the range of the owl and the murrelet.

On the Olympic National Forest, two sales, Caraco Cat and Rocky, may have potentially affected owls and murrelets. Caraco Cat removed 98 acres of owl habitat which may also have been low-quality murrelet habitat. Rocky removed 55 acres of owl and murrelet habitat.

In addition, Section 2001(k)(2) of the Rescission Bill provides that sales subject to Section 2001(k)(1) will not be released "if any threatened or endangered bird species is known to be nesting" within the sale unit. An August 23, 1995, letter issued by the Departments of Interior and Agriculture directs the U.S. Forest Service and BLM to utilize the Pacific Seabird Group (PSG) survey protocol as the best scientific method to determine where murrelets are nesting in timber sale areas, thereby complying with Section 2001(k)(2). Timber industry representatives sued the Secretaries on this interpretation, instead asserting that only direct, in-hand physical evidence of nesting (e.g., eggshell fragments) should be used to identify murrelet nesting stands. On January 19, 1996, Judge Hogan ruled in favor of industry. The government appealed this ruling to the Ninth Circuit Court of Appeals, and on June 14, 1995, the Ninth Circuit reversed Judge Hogan's ruling. Therefore, for the purposes of this biological opinion, the Service assumes that the U.S. Forest Service and Bureau of Land Management will not allow the harvest of any sale units that have been determined through the PSG protocol to be occupied murrelet nesting stands.

Consultation may be reinitiated if new information regarding the effects of implementing the Rescission Bill changes the baseline for listed species, resulting in new effects of this action in a manner or to an extent not previously considered.

BASELINE LANDSCAPE

As mentioned earlier, the Planning Area lies amongst a considerable amount of Federal land in the Central Cascades. The Alpine Lakes Wilderness is located in the north central portion of the Planning Area and extends to the north and east of the Planning Area. Norse Peak Wilderness is immediately to the south of the Planning Area and just to the north of the William O. Douglas Wilderness. The Clearwater Wilderness is located to the southwest of the Planning Area. Management activities will be virtually absent from these areas in terms of forestry and land management. Impacts will be primarily from dispersed recreation. Wilderness areas are often popular backpacking and horseback riding areas. Isolated locations with particular aesthetic qualities are often used intensively which results in soil compaction, trampling of wetlands, intense grazing, burning of woody debris for firewood, and use of local sources of drinking water by people and horses. In general though, most Wilderness areas will be maintained in a natural condition and will provide habitat for a wide range of species, including late-successional species.

Mt. Rainier National Park is located to the southwest of the Planning Area and is maintained in a relatively pristine condition. Large portions of this area are in high-elevation forests or are nonforested. Campgrounds and trails are found within the Park, but dispersed recreation is more strictly regulated than in most wilderness areas. Tourism (e.g., sight-seeing and photography) and education are the primary activities. The North Cascades National Park is north of the Planning Area, but is too distant to be considered for this analysis.

There are considerable amounts of forest lands outside the Planning Area. Late-Successional Reserves are found to the east of the northern portion of the Planning Area in the Teanaway drainage, to the southwest between the Clearwater Wilderness and the Norse Peaks Wilderness, and to the south and east of the Planning Area along with managed late-successional lands. The Snoqualmie Pass Adaptive Management Area (SPAMA) is found within the Planning Area and abuts the Alpine Lakes Wilderness area to the north. These lands will be managed with the objective of creating and maintaining late-successional habitat (USDA and USDI 1995). Matrix lands are found within the southeastern and western portion of the Planning Area, as well as outside and to the south of the central portion of the Planning Area. These National Forest lands, in conjunction with other Federal lands, completely bound the north, south, and northeast of the Planning Area. These lands will be managed in a very conservative manner and would contribute very little to impacts.

The Northwest Forest Plan designated approximately 55,256 acres of Federal land as late-successional reserve (LSR) within the Planning Area for the purpose of long-term support of owl habitat and population clusters. Due to the checkerboard ownership of the Planning Area, 41,392 acres of Plum Creek ownership are interspersed within these LSRs. Within the Planning Area there are also 219,569 acres within Adaptive Management Area boundaries (90,051 acres Forest Service, 92,755 acres Plum Creek) and 43,097 acres of Federal Matrix land with about 35,000 acres of Plum creek lands interspersed. Administratively Withdrawn Areas and Congressionally Reserved Areas form the bulk of the remaining acres of the 201,801 acres of Federal lands within the Planning Area (HCP Table 4).

Approximately 12 percent of the 418,690-acre Planning Area is composed of areas not capable of supporting commercial forest and known as "nonforested habitat". These areas consist of rock, ice, lakes, and other such habitats. Remaining forest types have been categorized according to Oliver et al. (1995) and described in HCP Section 2.3. Old Growth is found on about 6 percent of the Planning Area; while another 30 percent is in Mature Forest or Managed Old Growth. Dispersal Forest represents 17 percent. Pole Timber and Young Forest are 7 percent and 16 percent, respectively. The Shrub Sapling stage has only 2 percent of the Planning Area and the remaining 10 percent is in Stand Initiation. In terms of spotted owl habitat, 28 percent of the Planning Area is NRF, 20 percent is FD, and 40 percent is in other forest but not considered to be habitat. Road densities in the Planning Area average about 2.7 miles per section, and open road densities average 2.0 miles per section. In general, Plum Creek has slightly higher densities than the Forest Service, and other ownerships have much greater densities (HCP Table 14).

STATUS OF THE SPECIES (within the action area)

NORTHERN SPOTTED OWL

Landscape Considerations

The Scientific Advisory Group (Hansen et al. 1993), The ISC Report (Thomas et al. 1993), the final draft Recovery Plan (USDI 1992c), the proposed 4(d) special rule (USDI 1995a), and the Northwest Forest Plan (USDA et al. 1994a and 1994b) all refer to the Planning Area with significant concern. Connectivity of spotted owl populations north and south of the I-90 corridor has been raised as a major concern within the Planning Area. The Cascades are somewhat "hour-glass" shaped, with the Planning area occurring in the constricted portion of the Cascade Mountain Range. The presence of high-elevation forest unsuitable for use by spotted owls and expanses of high, barren country to the North and South of the Planning Area further limits the availability of habitats and owl clusters. Similar habitats within the Planning Area do not appear to be sufficient to limit connectivity and or increase the risk of isolation of the owl population in the North Cascades.

Because of the relatively large amount of survey work conducted by Plum Creek and the U.S. Forest Service's Pacific Northwest Research Station, spotted owl densities are known to be relatively high in this area. This indicates that connectivity between spotted owl populations north and south of the I-90 corridor is currently being maintained. Federal and State management efforts have recommended biological goals for nonfederal lands within the I-90 corridor to continue supporting this connectivity. These goals include:

- 1) Demographic support through the provision of supplemental nesting, roosting, and foraging habitat within or directly adjacent to reserve areas where Federal habitat alone may be insufficient to support viable owl clusters;
- 2) Demographic support and interchange through the provision of nesting, roosting, and foraging habitat to support some owl pairs between the Federal reserves;

3) Demographic interchange through the provision of dispersal habitats between reserve areas; and

4) Opportunities to negotiate for land exchanges to increase the level of protection of spotted owls in the checkerboard ownership (USDI 1992c; pages 117-119). The provision of higher-quality habitats and support of owl pairs through nonfederal management is considered most critical during the period of time that Federal reserve lands alone are deficient in habitat and owl pairs.

This analysis and the ISC Report indicate that, as a legacy of past harvests, a lower level of suitable habitat can be expected over the next 2-3 decades, with gradual improvement thereafter.

Relationship to the Final Draft Recovery Plan

Within the Western Washington Cascades Province, the final draft Recovery Plan identified 24 Designated Conservation Areas (DCAs), varying in size from 9,600 to 175,000 acres, and totaling 1,433,600 acres of Federal and nonfederal lands. In the Eastern Washington Cascade Province, the final draft Recovery Plan identified 20 DCAs, varying in size from 9,200 to more than 104,000 acres, totaling 864,200 acres of Federal and nonfederal lands. Two of the 24 DCAs designated in the Western Cascades Province (WD-7 and WD-8) and two of the 21 DCAs designated in the Eastern Cascades Province (WD-39 and WD-40) occur within the Planning Area (HCP Figure 9). HCP Table 2 summarizes the habitat types within each DCA by major ownership within the Planning Area. Most of the nesting, roosting, and foraging (NRF) and foraging and dispersal (FD) habitat within each DCA is on Forest Service land with smaller percentages of habitat occurring on Plum Creek's ownership.

The recommended biological goals for nonfederal lands within WD-7 and WD-8 (Western Cascades) include:

- 1) Providing for nesting, roosting, and foraging habitat within or directly adjacent to the DCAs in the checkerboard ownership;
- 2) Providing nesting, roosting, and foraging habitat to support the owl pairs that are established on Federal lands in the checkerboard ownership between the DCAs;
- 3) Provide dispersal habitat between DCAs; and
- 4) Provide opportunities to negotiate for land exchanges to increase the level of protection of spotted owls in the checkerboard ownership (USDI 1992c; pages 117-119).

The recommended biological goals for nonfederal lands within WD-39 and WD-40 (Eastern Cascades) include:

1) Provide nesting, roosting, and foraging habitat for spotted owls in or directly adjacent to WD-39 and WD-40;

2) provide dispersal habitat among the DCAs; and

3) manage habitat to provide characteristics necessary for roosting and foraging, but not necessarily for nesting. However, some nesting habitat may be needed in the short term, especially since the DCAs are deficient in owl pairs (USDI 1992c; pages 126-128).

Under the Northwest Forest Plan, the designated categories and Matrix include Federal lands within the DCAs established in the final draft Recovery Plan (USDI 1992c). The total acreage for each designated category and Matrix within the DCAs in the Planning Area (i.e., WD-7; WD-8; WD-39; and WD-40) is shown in HCP Table 3. Although located in different Washington Cascade Provinces, DCAs WD-8 and WD-39 are located primarily within Adaptive Management Areas, whereas most of WD-7 is within the Matrix, and WD-40 is almost completely within Late-Successional Reserves.

In comparison, nonfederal landscapes identified by the Scientific Advisory Group (Hanson et al. 1993) within the Planning Area include the Taneum, I-90 West, Easton, and I-90 East/Teaaway. The conservation functions recommended for these areas by that group were demographic support for the Taneum; demographic interchange (dispersal) for the Easton; and both for the I-90 West and I-90 East landscapes.

Population Considerations

As of October 1994, the WDFW recognized 1,113 sites, 348 in the Eastern Cascades and 492 in the Western Cascades. Of the 1,113 sites, 817 were confirmed pair sites. As of 1992, approximately 335 spotted owl activity centers, including 290 confirmed owl pairs, were known to exist in the Western Washington Cascades Province. Among these activity centers, 303 centers and 263 owl pairs were located on Federal lands (USDI 1992c). In the Eastern Washington Cascade Province, approximately 230 spotted owl pairs were located in the province; most are on Federal lands in the central and southern parts of the province. In the northern portion of the province, high mountains and a greater preponderance of lodgepole pine create naturally fragmented habitat with low potential for development of large clusters of spotted owls.

About 75% of the Planning Area has been surveyed to full protocol. This includes about 90% of the suitable habitat (HCP Figure 15)(Herter and Hicks 1995a). Because of the relatively large amount of survey work conducted by Plum Creek in the Planning Area, spotted owl densities in the area are known to be relatively high. There are about 107 known site centers in or near the Planning Area (HCP Figure 16; EIS Table 15), and of these 67 are centered on Plum Creek land. Of the 107 sites, 85 are pairs and 22 are observations of singles or 2 birds with pair status unknown. Since about 1989, there has been regular monitoring of known sites. Most known sites with a status of 1-3 have been surveyed and monitored in accordance with U.S. Forest Service -- Pacific Northwest Research Station (USFS-PNW) demography monitoring protocols.

More than 95 percent of the spotted owls encountered during surveying and monitoring in any one year were captured and banded with individual numbered leg bands and color bands. A summary of spotted owl sites containing banded birds, with the history of occupancy, nest status, number of young produced, and turnover of adults is shown in Herter and Hicks (1995a). Site centers that have contained at least one banded bird are shown in Herter and Hicks (1995a). These data represent the core group of sites that have been active in the recent past and these are the sites used in the analysis of owl productivity. The site history and status for 104 of the 107 sites monitored between 1990 and 1994 are summarized and presented in Herter and Hicks (1995a). Additional data are also presented on fecundity, dispersal, juvenile survival rates, mortality, and food habits. Herter et al. (1995) established a review process for spotted owl sites in the planning Area. Of the 107 sites, 82 displayed recent occupancy and, of those, 48 have been successful nesting pairs. Hicks et al. (1995) presented data on home range size and habitat use within the Planning Area.

Populations of spotted owls in the Cascade range can be placed into two groups based on geography and demographic variables. Owls on the west side of the Cascade Crest (and those just east of the Crest in the Douglas-fir/western hemlock forest class) appear to have lower productivity but higher longevity than their counterparts on the east side of the crest. Productivity of spotted owls, based on nesting data, from 1991 through 1994 is shown in Herter and Hicks (1995a).

Productivity of spotted owls in the Planning Area is comparable to neighboring study areas. HCP Table 6 provides standard productivity estimates (based on females) for spotted owls in the Planning Area. From 1991 through 1994, fecundity measurements were 0.430, 0.580, 0.039, and 0.547 female offspring per female owl. For most measures, productivity in the Planning Area is slightly lower than that of the adjacent USFS-PNW Cle Elum study area. This difference is due primarily to lower productivity of the west-side owls. If west-side and east-side owls are measured separately, productivity measures for east-side owls are very similar to the productivity measures reported in the USFS-PNW Cle Elum study area, and productivity measures exhibited by west-side owls is similar to the productivity measures reported in the USFS-PNW study for owls on the Olympic Peninsula. Of the 8 demographic study areas in the Burnham et al. 1994 meta-analysis, the Cle Elum area (in which the Planning Area partially lies) consistently showed higher productivity from 1989 to 1995. Estimates of juvenile survival rates on the Cle Elum and Olympic study areas were believed to be low due to emigration of dispersing juveniles from these areas (Burnham et al. 1994).

Lambda values were not calculated for the Planning Area because they would require additional tracking of juveniles to estimate juvenile emigration and survival. However, in the USFS-PNW Cle Elum study area, lambda estimates for 1989-1993 are not significantly different than 1.0 when adjusted for juvenile emigration (E. Forsman, U.S. Forest Service -- Pacific Northwest Research Station, pers. comm., 1996). The Lambda values increased from 0.924 (s.e. = 0.032) to 1.024 (s.e. = 0.058) when adjustments were made in juvenile survival rates, based on juvenile emigration rates from radio-telemetry studies. However, Forsman emphasized that the adjustments were based on a small sample size from only 2 years of data and may be subject to future modifications.

Predation (most likely from larger raptors such as great horned owl, red-tailed hawk, and northern goshawk), starvation, disease, advanced age, and accidents are the most likely causes of death among adult and juvenile owls (Herter and Hicks 1995; E. Forsman, U.S. Forest Service -- Pacific Northwest Research Station, pers. comm., 1996). Barred owls and goshawks are potential sources of mortality from predation. HCP Figure 18 shows barred and spotted owl sites in the Planning Area. There are almost as many barred owls in the Planning Area as there are spotted owls. There are also about 18 known goshawk sites within the Planning Area.

Habitat Definitions

Over the past four years, a considerable portion of the spotted owl range in Washington, including all of Plum Creek's HCP Planning Area, has been mapped using A/B (suitable) and C (marginal) habitat types. However, despite the wide application of the A/B/C habitat nomenclature, there are three primary shortfalls limiting its usefulness. First, A/B and C habitat is viewed by many as being a variation of spotted owl nesting habitat. As such, the important elements of dispersal habitat are not derived easily under this system. Second, the stand level parameters used to identify A/B and C habitat have included canopy closure, "*predominately larger trees*," and other identifiers which are often difficult to derive from standard forest inventories. Lastly, the identification of Type C (marginal) habitat has been an ongoing challenge, resulting in a surprisingly diverse array of forest stands mapped under this category (ranging from very dense, overstocked Douglas-fir/western hemlock stands on the west side of the Cascades to relatively open stands comprised of grand fir and lodgepole pine on the east side of the Cascades). Consequently, the Type C habitat designation has needlessly complicated efforts to model future stand development and to evaluate the importance of habitat quality and quantity in predicting future spotted owl occurrence.

Spotted owl habitat types used in the HCP include nesting, roosting, and foraging (NRF) habitat, and foraging and dispersal (FD) habitat. Plum Creek has defined FD and NRF habitat types, using data derived from site-specific spotted owl research, conducted by Plum Creek, in the Planning Area, and both NRF and FD habitat have been defined separately for forest conditions on the east side and west side of the Cascades (Hicks and Stabins 1995). Plum Creek made several basic assumptions prior to developing definitions for NRF and FD habitat.

These assumptions include:

1. A/B "suitable" habitat is NRF habitat;
2. High-quality Type C (marginal) habitat may serve as NRF habitat in the Eastern Cascades, whereas, mid- to low-quality Type C habitat generally provides at most, FD habitat at the stand level;
3. Some forest stands previously classified as "non-habitat" can be considered to be at least FD habitat, if radio telemetry and site center locations prove documented use; and
4. Vegetative plots of stand-level conditions surrounding spotted owl locations provide reliable data from which to describe owl habitat.

Several key parameters were used by Plum Creek to define spotted owl NRF and FD habitat. These include: tree species, quadratic mean diameter (QMD), relative density (RD), and fire management analysis zone (FMAZ). Minimum standards for classifying NRF and FD spotted owl habitat in the Planning Area were described in HCP Section 2.4.

Habitat Quantity and Quality

Currently, 20 percent of Plum Creek ownership and 28 percent of the entire Planning Area are NRF. About 20 of Plum Creek's lands are supporting FD habitat and 20 percent of the Planning Area is in FD as well. HCP Figure 36 displays the current distribution of owl habitat in the Planning Area. Only about 1.5 percent of Plum Creek's lands and about 6 percent of the Planning Area are in Old Growth. An additional 4 and 7 percent are in the Managed Old-Growth stage, respectively. These figures are very relevant because, although other mature forests may provide minimal or higher-quality nesting habitats, these stand structures will most likely provide the highest-quality habitat. HCP Figure 46 displays the current distribution of stand-structure types in the Planning Area.

Critical Habitat

On January 15, 1992, (57 FR 1796)(USDI 1992a), the Service designated critical habitat for the northern spotted owl. Attached Figure 1 shows the 112,308 acres of Federal lands included within the outer boundaries of the Critical Habitat Units. Only those Federal lands with the capability of supporting suitable owl habitat are actually designated as critical owl habitat. These areas correspond closely with late-successional reserves, the Snoqualmie Pass Adaptive Management Area, and DCAs -- areas identified previously as important for owls.

MARBLED MURRELET

Marbled murrelet populations in the vicinity of the project area have generally been considered to be low, based on occupancy surveys completed to date, as well as the numbers of murrelets present in the nearest marine waters. However, murrelet surveys have not necessarily been conducted in the best habitat, but have been conducted in conjunction with proposed activities such as timber harvest and road building. In general, the Central Cascades, especially along the I-90 Corridor, has been heavily harvested, and much of the potentially suitable marbled murrelet habitat that remains is highly fragmented and in small stands. In the project area west of the Cascade Crest, no murrelets have been detected in the Green River drainage to date, although detections have been recorded in the major river drainages to the north (Cedar River, South Fork Snoqualmie) and south (Greenwater River, White River)(Herter and Hicks 1995b).

East of the Cascade Crest, one unconfirmed detection of a murrelet at Gold Creek in the Snoqualmie Pass area was recorded in 1993. Surveys have been much more limited east of the Crest, with only three protocol surveys completed to date by the Forest Service. These have been in association with

timber sales and campgrounds, and the best habitat has not been surveyed. Therefore, the distribution and numbers of murrelets east of the Cascade Crest remain poorly known.

Low numbers of marbled murrelets are present on the nearest marine waters during the breeding season. However, small numbers of marbled murrelets are regularly seen in the Point Defiance area during the breeding season, directly west of the project area (D. Nysewander, WDFW, pers. comm., 1996).

Originally (January 27, 1994 Federal Register; 59 FR 3811)(USDI 1994a), the Service only proposed critical habitat to the north and south of the Planning Area. In a revised proposal, critical habitat for the murrelet was proposed for designation on about 6,800 acres of LSR within the Planning Area west of the Cascade Crest (60 FR 40892)(USDI 1995c). The Federal lands to the north of the Planning Area in the Cedar River watershed were proposed for designation but have since been transferred to the City of Seattle. The final rule designating critical habitat was published on May 24, 1996 (61 FR 26225)(USDI 1996) and designated 5,228 acres of Federal lands within the Planning Area (Attached Figure 2).

GRIZZLY BEAR

A recent evaluation of grizzly bear habitat in the North Cascades cited nine sightings of grizzly bears in the Planning Area (Almack et al. 1993). All of the sightings were reported between 1974 and 1991. Among the nine sightings, three are rated "Class 1" by the WDFW. A Class 1 rating is a "confirmed" sighting, usually indicating an observation by a qualified biologist and/or photograph, carcass, track, hair, dig or food cache. Six of the sightings are rated "Class 2". Class 2 sightings are considered "highly reliable" and are usually documented as an observation of a grizzly bear that was identified by two or more physical characteristics, but lacked the level of verification noted for Class 1 sightings.

Among the Class 1 sightings, one involved tracks, and two others involved observation of adult bears. Efforts to trap and radio-collar grizzlies in the Planning Area have been unsuccessful. All reported sightings of grizzlies have been located in the I-90 Lakes Subunit (i.e., that portion of the HCP east and north of I-90, including the areas surrounding Kachess and Cle Elum Lakes) of the Planning Area within the zone corresponding to the North Cascades Recovery Area (HCP Figure 7).

GRAY WOLF

Gray wolves have only recently been reported to occur in the Planning Area. According to WDFW records (WDFW database; August 11, 1994), a total of nine wolf sightings have been reported inside or within two miles of the HCP boundary. These sightings date back to 1984, but seven of the sightings occurred between 1992 and 1994. Seven of the reports were of single adults, and based on sightings, tracks, and responses to howling calls. Wolf reports have not been assigned a

"reliability rating" as have grizzly bear reports. All nine wolf reports have been located on the east side of the Cascades in and adjacent to the Planning Area. Eight of the nine reports have been from the southeastern corner of the Planning Area near Taneum Creek, which is within a federally designated Late-Successional Reserve.

BALD EAGLE

There is one known bald eagle nesting territory within the Planning Area. The territory is located near the banks of Cle Elum Lake on Forest Service land within close proximity to Plum Creek lands. In addition, because of the numerous streams within the area that contain anadromous fish, there may be several areas within the Planning Area that may be used by wintering bald eagles. However, there are no major winter concentrations of bald eagles or communal night roosts known to occur within the Planning Area.

PEREGRINE FALCON

The Planning Area contains some habitat that could be considered as nesting habitat for the peregrine. In addition, the area may receive some use by spring and fall migrant peregrine falcons. However, peregrine falcons have not been confirmed as residents of the Planning Area.

EFFECTS OF THE PROPOSED ACTION

NORTHERN SPOTTED OWL

Introduction

The effects of timber harvest on suitable owl habitat depend upon the silvicultural prescriptions used and the condition of the habitat prior to harvest. Impacts to owls may vary from a complete loss of habitat, to a degradation of habitat, to relatively minor impacts.

Impacts to pairs and resident singles are addressed through an analysis of suitable owl habitat within the expected provincial home range radius around a central core area or nest site, as described below. Several parameters provide a useful guide for biologists in evaluating the effect of habitat reduction on owls. These should include, but are not limited to, the location and amount of habitat loss (or degree of degradation) relative to the core area and key foraging locations, if known. In making a determination for this biological opinion, the Service evaluated provincial and range-wide impacts to the owl.

The Service generally applies three criteria to determine the magnitude of effect on the owl by a particular action: (1) Removal of the best available, most contiguous suitable owl habitat within a 70-acre core area surrounding the nest site or activity center of a resident single or pair; (2) Removal

of suitable owl habitat so that less than 500 acres of habitat remain within 0.7 miles of the nest site or activity center of a resident single or pair; and (3) Loss of suitable owl habitat around a pair or resident single activity center so that less than 40 percent of the area within a circle approximating the median provincial home range remains as suitable habitat. In this area, the provincial median home range size is about 6660 acres of which 40 percent is about 2,663 acres, based on a circular home range with a radius of 1.82 miles. If one or more of these criteria apply, the Service considers the activity at risk for "take" of the owl as defined under the Act. In addition, timber harvest and related activities within 0.25 miles of active owl nest sites may result in disturbance to nesting pairs with adverse effects on reproductive success.

Type of Effects

Little direct mortality is expected as a result of timber-management activities conducted under the HCP. In addition, Plum Creek will use discretion when entering likely stands for management and will consider the use of project-level surveys to check for nearby resident owls. It is believed that this will help avoid direct harvest of nest sites as well as the disturbance associated with activities within 0.25 mile of a nest site during the breeding season. Removal of habitat is the impact upon which we focused this analysis. Harvest of habitat does not automatically correspond to take. For the reasons outlined in Appendix 1 of this document, several methods were used to assess the effects of habitat removal and retention on owls.

Results of GIS Analyses

Appendix 1 of this biological opinion describes the methods used to analyze the amount and level of take northern spotted owls would be exposed to under the HCP. Results are presented below by the categories described in the methods. Some results are presented for the first, third, and fifth decades. The Service included the third decade to analyze the transition period which is expected to last through the first 2-3 decades. Impacts beyond the 50-year Phase I are expected to be similar to that described for the fifth decade.

Take Analysis for Existing Sites

The Service performed an assessment of take regarding existing sites using the 40-percent/1.8-mile and 50-percent/0.7-mile criteria. This was performed by assessing predicted habitat amounts within a 0.7- and 1.8-mile radius of existing sites for the first, third, and fifth decades of the HCP. Attached Figures 3 through 8 display expected habitat amounts within both radii for the current situation, midway through Phase I of the HCP, and for the end of Phase I at 50 years, respectively. Results of this analysis indicated that 7 existing sites may be at risk of take during the first decade, 6 sites during the third decade, and none during the fifth decade under the proposed action. The differential level of estimated take between the proposed action and the No-action Alternative is 2 additional sites during the first decade, 3 additional sites during the third decade, and 1 fewer sites during the fifth decade (Attached Figure 9).

Take Analysis for Generated Sites

Using the methods for generating hypothetical sites described in Appendix 1 of this document, the Service predicts that 47 pair sites would exist in 1996 given the current distribution of habitat and that 15 of those could be at risk of take during the first decade. The Service predicts that 39 and 37 pair sites would exist at the beginning of the third and fifth decades, respectively, given the projected amounts and distribution of habitat, and that 11 and 1 of those sites would be at risk of take during the third and fifth decades, respectively. In comparison to the No-action Alternative, there would be no additional sites at risk of take during the first decade, 4 additional sites at risk of take in the third decade, and no additional sites at risk of take in the fifth decade (Attached Figure 10).

Impact Analysis for Existing Sites

Results of this analysis indicated that 8 existing sites may be at moderate to high risk of impact during the first decade, 5 sites during the third decade, and two during the fifth decade under the proposed action. The differential level of moderate or high risk of impact between the proposed action and the No-action Alternative is 3 additional sites during the first decade, 1 additional site during the third decade, and 2 additional sites during the fifth decade (Attached Figure 11). When FD habitat was considered, the number of sites expected to be at moderate to high risk of impact was reduced (Attached Figure 12).

Impact Analysis for Generated Sites

The Service predicts that 78 pair sites would exist in 1996 given the current distribution of habitat and that 26 of those would be at moderate to high risk of impact during the first decade. The Service predicts that 62 and 67 pair sites would exist at the beginning of the third and fifth decades given the projected amounts and distribution of habitat, and that 9 and 2 of those sites would be at moderate to high risk of impact during the third and fifth decades, respectively. In comparison to the No-action Alternative, there would be 4 additional sites during the first decade, 3 additional sites in the third decade, and 2 additional sites in the fifth decade (Attached Figure 13) which would be at moderate to high risk of impact. When FD habitat was considered, the number of sites expected to be at moderate to high risk of impact was reduced (Attached Figure 14).

Predicted Carrying Capacity based on GIS Analysis

The number of sites generated by this analysis yielded similar results to the RSPF model (Irwin and Hicks 1995), described below. Using viability classes and NRF habitat only, the number of sites generated for 1996, 2016, and 2036 are 78, 62, and 67 for the proposed action and 76, 61, and 70 for the No-action Alternative (Attached Figure 15). Consideration of FD habitat resulted in a larger estimate of owl sites (Attached Figure 16). Using the 40- and 50-percent thresholds, fewer viable sites were generated (Attached Figure 17); 47, 39, and 37 for the proposed HCP and 43, 40, and 42 for the No-action Alternative.

Predicted Carrying Capacity based on the RSPF Model

HCP Figure 39 displays the predicted changes over the permit period for both the proposed action and the No-action Alternative. In general, there is a reduction in capacity over the first 20-30 years, followed by a recovery period. The differences between the 2 alternatives is extremely slight in terms of predicted amounts of NRF habitat and resulting number of owl sites. The reduction of owl sites is predicted to be relatively minor, with about 85 percent of the current number of sites continuing throughout the life of the Permit Period. The modeled No-action Alternative yields similar results; but, again, that No-action Alternative scenario was very optimistic. The RSPF considers several factors in its analysis, but the primary driving force behind the model is the amount of NRF habitat.

Habitat Amounts

HCP Table 24 displays the amounts of NRF and FD on both Plum Creek lands and the Planning Area as a whole. The Service assumes that habitat amounts will be no lower than that predicted for year 50 during the following 50 years. On Plum Creek lands, NRF habitat is expected to decrease from about 20 percent to no less than 12 percent during the first decade and to no less than 9 percent during the second decade. At no time during the 100-year Permit Period would the amount of NRF habitat be less than 8 percent of Plum Creek lands. FD habitat is expected to increase from a current level of about 20 percent to 46 percent during the Permit Period. Total owl habitat on Plum Creek lands would change from 40 percent to 55 percent over the 100-year Permit Period. NRF in the Planning Area is expected to decrease from 28 to 26 percent over the life of the HCP, with a low of 23 percent midway through the HCP. FD is expected to increase from 20 to 35 percent of the Planning Area. Total owl habitat (NRF and FD) is expected to increase from 48 to 61 percent. These values are very similar to that expected under the No-action Alternative.

Attached Table 2 describes the amounts of NRF habitat under the 2 alternatives within each NWFP landscape and for each of the DCAs. In general, a greater percent of the landscape is expected to be in NRF habitat within the areas most important for demographic support. For instance, within WD-40, 18 percent of Plum Creek lands are expected to be NRF habitat for a total of 48 percent of WD-40 in NRF habitat at year 2045.

Given the extensive analysis by the ISC, the Spotted Owl Recovery Team, and ultimately FEMAT, the Service believes that the system of LSRs in place throughout the range of the species will likely provide for most of the conservation and recovery needs of the species. AMAs with late successional objectives, such as the SPAMA which also has an objective for connectivity, will likely contribute to meeting the needs of owls as well. LSRs, AMAs, and the intervening matrix lands are expected to be capable of maintaining large clusters of reproductively viable owls across the range of the species. The likelihood of maintaining reproductively viable clusters should increase and local extirpation should be prevented if clusters are adequately interconnected to provide demographic support (Thomas et al. 1990). As the proposed action is confined to a localized area and mitigation measures will allow for connectivity and viability of the population, range-wide impacts due to habitat loss and incidental take of individual owls are expected to be minimal.

In assessing the provincial impacts of this action and the estimated level of incidental take, the Service analyzed the current condition of the adjacent and interspersed Federal lands to determine whether this action will reduce or preclude these lands from functioning as intended. The evaluation focused on the connectivity of the North and South Central Cascades and maintenance of demographic support.

In the proposed HCP, some NRF habitat is harvested while other NRF habitat is retained. However, there is a large increase in FD habitat. The FD habitat cannot wholly substitute for NRF, but does serve an important role on the landscape. It supports owls during and between nesting periods, it is used to travel from one patch of NRF to another, and it serves to buffer NRF patches from external influences thereby effectively creating a large patch of forested habitat.

Retention and growth of FD and NRF over time improve total habitat amounts and off-set harvest so that functional patch size and connectivity should increase thereby better linking the isolated Federal sections which may contain suitable owl habitat. Specific use of dispersal corridors over the life of the HCP further ensure the ability of owls to utilize NRF habitat on Federal and private lands within the Planning Area. Also, with the increase in total habitat, there is a corresponding decrease in forested but nonhabitat lands. This will reduce the fragmentation and contribute to the development of a more usable landscape.

Site-specific deferrals surrounding some of the more productive owl sites during the first 20 or more years should further serve to ameliorate some of the impacts which otherwise would have been expected to occur. Maintenance of these owl sites through the first 20 years will allow regrowth of owl habitat in many areas and thereby reducing impacts of harvest once these deferrals are finally harvested. Site-specific deferrals were located in areas of overlapping owl circles across the I-90 corridor to facilitate movement of owls through this area.

Changes in the amount of habitat within existing sites were examined. Attached Figures 18 and 19 display the changes expected to occur over the next 50 years within 0.7 and 1.8 miles of existing sites. Figures 20 and 21 compare the amount of habitat expected in 2045 with the amount predicted for the No-action Alternative in 2045 for both 0.7- and 1.8-mile radii of existing sites.

Critical Habitat

The impacts of the proposed action upon critical habitat are expected to be minor. Although harvest will occur adjacent to patches of Federal critical habitat, the overall net effect should be an improvement of the conditions on the neighboring private lands due to the changes in habitat amounts described above. This should result in larger effective patch sizes and greater connectivity across the landscape. Several principles guided the selection of critical habitat units (USDI 1992a):

- 1) Develop and maintain large contiguous blocks of habitat to support multiple reproducing pairs of owls;
- 2) Minimize fragmentation and edge effect to improve habitat quality;

- 3) Minimize distance to facilitate dispersal among blocks of breeding habitat; and
- 4) Maintain range-wide distribution of habitat to facilitate recovery. The proposed HCP appears to contribute to the attainment of these goals in every way.

Summary of Effects

The Service assessed both impact and expected amounts of take using existing sites and analyzed how those sites would fare by decade. Some of these sites are currently vacant, some sites by the definition of this static approach could be taken multiple times. However, because owls are expected to respond to a changing habitat base by moving, abandoning, or establishing new sites, the Service also used the dynamic analysis (generated sites) described in Appendix 1 of this document. Many sites considered as taken might continue to remain in spite of the impact. The most important issue is not the amount of take, but the remaining number of sites and their ability to function productively. Therefore, the Service has partially relied on the RSPF model (Irwin and Hicks 1995) which is based upon a complex set of assumptions related primarily to habitat availability. This model is described in greater detail in HCP Section 2.9. The Service analyzed the changes in probabilities of occupancy which are expected to occur over the Permit Period (Attached Figure 22). In the final analysis, the determining factor for owls is the amount and distribution of habitat in the area.

The Service expects suitable nesting habitat to be 28 percent, 23 percent, and 26 percent at 1996, 2016, and 2045. The Service also expects this will result in 130, 110, and 120 sites of which 87, 73, and 80 will be pair sites at those times. This reduction in owl site centers and change in nesting distribution could cause a 9 percent reduction of owls in the Planning Area. This projected number of owl sites would still exceed the owl population levels projected in the future for DCAs on Federal lands in the Planning Area (USDI 1992c). While this represents up to a 9% reduction in the projected current potential of the area to support viable, productive sites, the loss will be spread over several years or decades and should not be large enough to jeopardize the species at the local, regional, or range-wide levels.

Over the course of the Permit Period, as many as 83 sites may be at risk of impact. Most of these sites (73) could be at risk during the first 50 years. The majority of take is expected to occur early in the plan. For instance, 34 sites may be impacted during the first decade. A logical analysis of these figures indicate that much of this impact may result from the actions of other land-managers in the Planning Area, and that only 20 sites (7 recently occupied sites) are most likely to be impacted during the first 2 decades. In both 1994 and 1995, only four of these 7 sites produced young (Herter et al., 1995) (H. Stabins, Plum Creek Timber Company, pers. comm., 1996). Stated as a range, the loss of owl sites as a result of Plum Creek actions during the first 20 years could be from less than 7 to about 20 (7 percent to 19 percent of 107 known sites). Sufficient numbers of spotted owls should be maintained in the Planning Area to meet Recovery Plan and Northwest Forest Plan objectives, and maintain viable owl populations.

In many respects it is impossible to separate the action, impact, and mitigation. Removing a portion of the NRF appears to be the action, having less NRF is the impact, and retaining some of the NRF is partial mitigation. Providing additional FD habitat and site-specific deferrals is also mitigation. One encouraging result is the reduction in the amount of land which is not habitat. Because this decreases rather dramatically, from 40 percent to 27 percent (HCP Figures 36-38), the landscape becomes more conducive to the movements and existence of owls. Impacts are ameliorated by the provision of NRF and FD in such a way that owls are maintained and the amount of forested nonhabitat is greatly reduced. These factors will contribute to landscape conditions conducive to the movement and support of owls and connectivity between individual habitat reserve areas or population clusters.

MARBLED MURRELET

Introduction

The effects of timber harvest on murrelets depends primarily on whether a stand is being used for nesting (occupied) or is adjacent to an occupied stand. The effects of timber harvest on marbled murrelet habitat depend upon the silvicultural prescriptions used and the location of the harvest in relation to suitable habitat. Clear-cutting of marbled murrelet habitat and other harvest prescriptions that result in even-aged, monotypic forests do not produce suitable murrelet habitat unless rotations are extremely long. Silvicultural prescriptions that promote multi-aged and multi-storied stands may, in some cases, retain suitability for murrelets and perhaps increase the quality of habitat over time. The time-frame within which this might occur is unknown and site-specific. However, it is far more likely that silvicultural activities within stands that are already suitable habitat would reduce their suitability for some time to come.

"Take" can include the harvest of occupied stands, where it results in harm or harassment to individual murrelets. Even when following conservation strategies in which no currently known occupied stands would be harvested, there are several situations in which take could occur:

1. Occupancy in unsurveyed "lower-quality" habitat not captured by the prioritization system. For instance, there is a chance that some habitat less than 5 acres; with fewer than 8 trees per acre, 32 inches and larger; or on the east side of the Cascade Crest supports murrelets.
2. No detections during survey of occupied stand. This is more likely when surveys are not done to protocol standards
3. Sites which are established or discovered in the future may be harvested.

In addition to take, other impacts are possible. Impacts may include a complete loss of suitable unoccupied habitat (clear-cut), a degradation of habitat (some selective harvest), or harvest of unsuitable habitat adjacent to and contiguous with suitable habitat (removing potential for future habitat or causing disturbance, or removing the "buffering" effect of the surrounding nonhabitat).

Considerable evidence links the declining numbers of marbled murrelets to the removal and degradation of available suitable nesting habitat (Ralph et al. 1995). The harvest of unsurveyed marginal habitat, some of which may be occupied, or harvest of other stands which may in the future be occupied can potentially adversely affect the murrelet population in several ways. These include:

- > Direct individual mortality or disruption of essential breeding and sheltering behaviors if harvest occurs during the nesting season;
- > The immediate displacement of birds from traditional nesting areas;
- > The concentration of displaced birds into smaller, fragmented areas of suitable nesting habitat that may already be occupied;
- > Increased competition for suitable nest sites;
- > Decreased potential for survival of remaining murrelets and offspring due to increased predation;
- > Diminished reproductive success for nesting pairs;
- > Diminished population due to declines in productivity and recruitment; and
- > Reduction of future nesting opportunities.

Marbled murrelets have few natural defenses from predation and the ability to remain concealed is essential for successful reproduction. Continued fragmentation of habitat is likely to result in increases in forest edges and the displacement of murrelets to already-occupied habitat. The increased murrelet densities and exposure to edges in remnant nesting habitat may make birds more susceptible to predation. Predation by corvids and raptors is a known cause of murrelet nest failure. From 1974 through 1993, 67 percent of all known marbled murrelet nests in the Pacific Northwest failed due to predation. Successful nests were also significantly further from edges (Nelson and Hamer 1995). Corvid predation on the nests of small birds is known to increase with increased forest fragmentation or decreased distance of nests from a forest edge (Gates and Gysel 1978, Andren et al. 1985, Small and Hunter 1988, Yahner and Scott 1988).

It is likely, but unknown, if individual murrelets return to the same nest sites or forest stands in consecutive years. Most species of alcids exhibit high nest site fidelity (Tuck 1960, Nettleship and Birkhead 1985, Kress and Nettleship 1988, Gaston 1992), as do many other species of birds nesting under a variety of environmental conditions (Terres 1980). The prevalence of this trait in so many bird species strongly suggests that the behavior confers distinct survival advantages.

Occupation of traditional nesting sites over many generations is common in species that display strong nest site fidelity (Terres 1980, Ehrlich et al. 1988), and murrelet nesting sites appear to be traditionally used. Observations of nest sites have shown that murrelets nest in the same trees in

consecutive years. The potential for colonization of new nesting sites, assuming adequate suitable habitat is available, is not known. If significant losses of occupied habitat were to occur, it would likely hamper efforts to stabilize the population and ultimately to recover the species (Ralph et al. 1995).

Potential Impact of Actions

The proposed action is designed to reduce the potential for incidental take which would result from the harvest of nesting habitat. To accomplish this objective, stands that were considered most likely to be occupied were surveyed according to the Pacific Seabird Group protocol or with a modified Pacific Seabird Protocol (three survey visits per year instead of four visits per year). Many stands were related to access requests and were surveyed to protocol. Additional surveys were conducted as part of the HCP. The reduction in survey intensity was designed to allow a redistribution of survey effort to stands which may otherwise have gone unsurveyed (i.e., those greater than 40 miles from marine waters) with only minor changes in survey effectiveness. If no detections occurred with these surveys, harvest of the stand would be allowed. Under the full survey protocol (4 visits per year for 2 years), the stands would be considered unoccupied, and the risk of take would be insignificant. The probability of detecting murrelets declines from 97 percent to 93 percent with 3 visits instead of 4 visits. Another interpretation is that the probability of detection with 6 visits over 2 years, as opposed to 8 visits, continues to remain high at about 99 percent. The risk of nondetection in an occupied stand is higher in low-quality habitat because of the difficulty of detecting murrelets even with four visits. In high-quality habitat, a higher density and, therefore, higher level of activity is expected which reduces the chance of missing birds if present. Low-quality stands are where much of the probability of not detecting murrelets when they are actually present probably occurs (T. Hamer, Hamer Environmental, pers. comm., 1995).

Measures incorporated into the HCP which will reduce the loss of known occupied sites have been described previously. However, a minor decrease in the amount of suitable marbled murrelet habitat available in the Planning Area will result from the proposed action. The loss of unsurveyed, suitable habitat and unoccupied suitable nesting habitat should not be so large as to increase the risk that murrelets would not become established, or if ever established, would not persist in the Planning Area. Significant losses of suitable but unoccupied habitat might hamper the recovery potential of the species in south Puget Sound, given the current lack of suitable nesting habitat and existing small populations in the area. However, smaller decreases in suitable nesting habitat, such as those expected to occur with the HCP, are expected to have less drastic effects.

Green River Road Access

A total of 224 west-side acres are being surveyed to full PSG protocol. If any of these stands are occupied they will receive site-specific protection equivalent to the entire habitat block or, alternatively, the best 500 acres. Unoccupied stands would be released for potential harvest.

West-side Suitable Habitat

For the 256 west-side acres which would be surveyed using the modified protocol, there is a small, but quantifiable, additional level of risk that a stand could be occupied even though no detections were recorded during surveys, and an occupied stand would be harvested.

West-side Low-quality Habitat

In the Western Cascades portion of the Planning Area, 400 acres of lower-quality, but possibly suitable, habitat, were not surveyed. This habitat is characterized by less than eight trees per acre which are greater than 32 inches in diameter, fewer platforms, fragmentation by railroad and powerline rights-of-way, and lack of a protective canopy among likely nesting trees. Although occupied stands have been found with as few as one old growth tree per acre (K. Nelson, Oregon Cooperative Wildlife Unit, pers. comm., 1996), it is far less likely that habitat of this quality may be occupied. Habitat which contained characteristics indicating occupancy was unlikely and no field verification was needed totaled 118.8 acres in 2 stands. An additional 10 stands containing 281.3 acres of low-quality habitat was field verified. The size of these stands varied from 7.6 to 60.9 acres and the number of large trees ranged from 0 to 7.5 trees per acre.

East-side Habitat

East of the Cascades, no surveys for marbled murrelets were conducted. Again, it is possible that some of these stands might be occupied, although the probability of an individual stand being occupied is extremely low, especially considering the distance to marine waters and the obstacle imposed by the Cascade Crest.

To obtain an estimate of potential harvest in suitable stands that may occur during the HCP, a review of stand-structure information was conducted. East-side acres which may be murrelet habitat are most likely in the Douglas-fir/grand fir forest class and in either the Old Growth or Managed Old Growth stand-structure category. This is currently 2 and 5 percent of Plum Creek's 66,915 acres in this zone (Attached Table 3). At year 2016 these amounts would be 2 and 3 percent, and for 2045 these amounts would be 3 percent for both Old Growth and Managed Old Growth. This implies that there will be about 1-2 percent of Managed Old Growth harvested and 1 percent will become Old Growth. Most, if not all, Old Growth will be retained. If one considers that Managed Old Growth and Old Growth are not very dynamic and can only be grown over long periods of time, it is unlikely that harvests would be very high. Therefore, little of the better murrelet habitat is likely to be harvested on the East Side, with about 1-2 percent of the Plum Creek acreage in the Douglas-fir/grand fir Forest class as the estimate for harvest over the course of the plan. This corresponds to 700-1,400 acres of total murrelet habitat.

Landscape Assessment

When considering all lands in the Planning Area as well, landscape-level projections for Old Growth on the East Side in years 1996, 2016, and 2045 are 4, 7, and 10 percent respectively. These

estimates for Managed Old Growth are 13, 9, and 8 respectively, for total habitat amounts of 17, 16, and 18 percent. It would appear that murrelet habitat should improve over the course of the Permit Period on the East Side. Old growth currently comprises 9 percent of the Douglas-fir/western hemlock forest class on the west side of the Planning Area and should provide at least 8 percent at years 2016 and 2045 (HCP Table 30b). Managed Old Growth is expected to remain constant at about 1 percent. This would translate to 7,072 acres of Old Growth and 884 acres of Managed Old Growth in year 2045 on the West Side.

Impacts

Plum Creek may harvest 400 acres on the West Side and about 700-1,400 acres on the East Side, of lower-quality, unsurveyed habitat. Up to 480 acres of surveyed, unoccupied habitat may also be harvested on the West Side, depending on the outcome of ongoing surveys.

Type	Surveys	Acres	Proposed Action
Green River Road Access	Full PSG Protocol	224	Protect best 500 acres of occupied stand. Harvest unoccupied stands
West Cascades HCP (Suitable)	Modified PSG Protocol (3 Visits)	256	Protect best 500 acres of occupied stand. Harvest unoccupied stands.
West Cascades HCP (Low Quality)	No Surveys	400	Potential Harvest
East Cascades HCP	No Surveys.	1-2% of Douglas-fir zone east of the Cascade Crest	Potential Harvest

Site-specific protection under this plan will result only if occupied stands are located. If an occupied stand is identified, the entire block of habitat (or the Plum Creek portion of the 500 best acres) would be maintained. This will result in maintenance and improvement of habitat quality in those portions of the habitat. The best 500 acres, however, could include Forest Service land if the stand is contiguous with Forest Service land. The benefits derived from the proposed HCP could therefore vary, since stands occupied by marbled murrelets on Forest Service lands would be already protected under the Northwest Forest Plan. If no occupied sites are located on Plum Creek lands, there will be no site-specific habitat protection for marbled murrelets. However, sites discovered on Forest Service lands would continue to be protected from disturbance, but adjacent Plum Creek lands might be harvested outside the breeding season.

Noises associated with timber harvest would not likely disturb nesting murrelets in adjacent, occupied habitat. Although there is little detailed information concerning the murrelet's vulnerability to disturbance effects, research on a variety of other bird species suggest that such effects are possible. These studies have shown that disturbance can affect productivity in a number of ways including: nest abandonment, egg and hatchling mortality due to exposure and predation, depressed feeding rates of adults and offspring, and avoidance of otherwise suitable habitat. For these reasons, the HCP precludes road building and timber harvest within 0.25 miles of occupied stands during the breeding season.

Critical Habitat Effects

No direct harvest of critical habitat will occur as all lands so designated within the Planning Area occur on Federal lands. Additionally, should any of those lands become occupied, they would receive protection from disturbance. The HCP limits the actions which may occur within 0.25 miles of an occupied stand during the nesting season. Edge effects are possible due to harvesting of adjacent stands on Plum Creek lands. The landscape is currently fragmented and suitable patches of habitat on Plum Creek lands are currently small. It is expected that some impact to the edge of critical habitat is possible but that, overall, the forest conditions will improve over the course of the Plan. The improved forest conditions should improve the effective patch size and help reduce the negative effect of edge and predation.

Summary of Effects

The HCP would provide site-specific protection to occupied sites discovered during surveys of the most-likely habitats. The proposed plan is unlikely to contribute nesting opportunities on Plum Creek lands to the recovery of marbled murrelet numbers, because future occupied stands can be harvested and only seasonal protection provided. Any stands that are found to be currently occupied could also be harvested if found to be unoccupied for 5 years. However, the HCP, in conjunction with the NWFP is expected to maintain Old Growth and Managed Old Growth at current levels in the Douglas-fir/western hemlock zone, and to increase the amount of Mature Forest and Dispersal Forest from 47 to 58 percent of this zone within the Planning Area. These factors combined with the continuity presented by healthy mature riparian systems should benefit murrelets in the Green River drainage. Forests providing suitable nesting habitat and nest trees generally require 200-250 years to develop characteristics that supply adequate nesting platforms. Hamer and Cummins (1990) found greater detections in better landscapes. Raphael et al. (1995) suggested tentative guidelines for landscapes based upon likelihood of higher occupancy rates. Murrelets are generally found in larger stands of older forest, or at least older forest surrounded by mature forest. Current conditions in the Green River drainage represent a fragmented landscape with few residual stands. History of fire 80 years earlier left few residual stands intact, and only isolated remnant trees remain in many stands.

The proposed action occurs in an area where Federal land currently provides habitat, and could potentially provide significant amounts of additional habitat in the future. The few known occupied sites in the adjacent areas outside the Planning Area are currently on Federal lands. The Service

believes that these Federal lands, a significant portion of which are to be managed as Late-Successional Reserves or Adaptive Management Areas, will meet most of the survival needs of the marbled murrelet in this area. Additionally, 5,228 acres of these Federal lands have been designated as Critical Habitat Units (CHUs) within the Planning Area.

GRIZZLY BEAR

Recent research suggests that open roads with unrestrained public use can contribute to grizzly bear mortality, and females with cubs typically exhibit less preference for areas with high road density (Mace and Manley 1993; U.S. Fish and Wildlife Service 1993). Home range and habitat studies of grizzly bears suggest that optimal bear habitat includes a mixture of forested areas, used for hiding and thermal cover, as well as open meadows, avalanche chutes, and harvested sites where bears forage for plants and small mammals (LeFranc et al. 1987). Concerns regarding open road density and available preferred habitat are related in that excessive open road densities may displace grizzly bears from otherwise preferred habitat or expose bears to greater mortality risk should they become attracted to habitats with road networks used extensively by humans.

One of the objectives of the Grizzly Bear Recovery Plan (USFWS 1993) is to manage grizzly bears and grizzly bear habitat within the Recovery Zone. According to the Plan, *"the recovery of a sustainable grizzly bear population is expected to be a slow, gradual process requiring decades. Given the present, very small population of grizzly bears in the North Cascades Grizzly Bear Recovery Area the initial target for human-induced mortality is zero."* To maintain consistency with the goals and objectives of the Federal Recovery Plan, Plum Creek will concentrate the Company's grizzly bear management efforts within the Recovery Zone (in the I-90 Lakes Subunit). The I-90 Lakes Subunit comprises 115,462 acres (28 percent of the Planning Area; HCP Table 14 and HCP Figure 20), and contains those portions of the Recovery Zone which lie within the Planning Area. The Forest Service is the largest land owner in the subunit (68,120 acres), followed by Plum Creek (40,579 acres), and other private landowners (6,763 acres).

Open-road density is exceptionally high in the I-90 Lakes Subunit. Security areas are defined as areas where open-road density is 1.0 mile per square mile or less. Security areas encompass 77,497 acres or 67 percent of the I-90 Lakes Subunit (HCP Table 14; HCP Figure 22).

Currently, 17 percent of the security area in the I-90 Lakes Subunit serves the function of foraging habitat, while 61 percent provide hiding/thermal cover. Although 25 percent of the security area is considered "non-forested," this area includes meadows and alpine areas that will serve as foraging areas for bears and these areas will remain unaffected following implementation of the HCP.

To address habitat concerns and increase the potential for grizzly bears to occupy and successfully reside in the I-90 Lakes Subunit, Plum Creek will implement a series of Best Management Practices (BMPs) to maintain habitat in a condition that allows bears to meet their essential biological needs. Plum Creek will implement the BMPs in two phases. The pre-verification phase will be implemented upon issuance of the permit. The objective of this phase will be to create conditions

in the I-90 Lakes Subunit that are conducive to grizzly bear re-occupancy of the area. The post-verification phase will be implemented following verification that grizzly bears are residing in the subunit. The post-verification phase will include more-aggressive actions and measures to ensure protection and survival of resident bears.

Pre-verification BMPs will include:

- 1) Restrict Public Use - Restricting public use and minimizing the potential for grizzly bear disturbance and displacement by installing gates on roads which Plum Creek has total administrative control. Administrative use of roads by Plum Creek to manage its lands is allowed and consistent with the intent of these road closures;
- 2) Open Road Density - Reducing open-road density to 1.0 mile per square mile on Plum Creek's lands in the I-90 Lakes Subunit within the first decade of the Permit Period (i.e., 2006). "Open" is defined as roads open to the public. Roads which Plum Creek does not have total control (e.g., paved roads or roads to private residences) are excluded from the road-density requirement. Permanent (i.e., year-long) road closures and seasonal closures that coincide with likely use of the subunit by grizzly bears are considered to meet this requirement;
- 3) Visual Screening - Retaining visual screening along open roads on Company property to minimize disturbance and potential illegal killing of grizzly bears. Visual screening is defined as trees and vegetation which can effectively obscure up to 90 percent of a grizzly at a distance of 100 feet. To the extent possible, this requirement will be achieved by retaining submerchantable trees and shrubs rather than commercially valuable trees. Roads, (including gated roads) closed to the public are excluded from visual screening requirements; and
- 4) Prohibit Firearms - Prohibiting firearms in all Company and contractor vehicles within the Recovery Zone in the I-90 Lakes Subunit, except where firearms are a necessary part of the duties of Company personnel (e.g., law enforcement/security).

Post-verification BMPs will be implemented by Plum Creek once the Services verify that grizzly bears have successfully recolonized and reside in the I-90 Lakes Subunit. Verification will consist of successful denning by grizzly bears in the subunit and/or multiple sightings of grizzly bears with cubs. Post-verification BMPs will be implemented within one year of Service verification and include the following actions.

Post-verification BMPs will include:

- 1) Road Closures - Plum Creek will provide additional road closures and barriers on roads managed jointly by Plum Creek and the Forest Service in the I-90 Lakes Subunit.
- 2) Road Location and Construction - In the event that grizzlies are confirmed in the Planning Area, new roads, where necessary, will be constructed to avoid preferred bear habitat types. Where possible, Plum Creek will avoid aligning main haul or other roads, that will remain

open, through the center of clearcuts and seedtree harvest units. Road management criteria will include: (1) Minimizing the number of miles of road needed to achieve the objectives of each timber sale; and (2) Maximizing the use of local roads, and minimizing the use of arterioles and collectors. In addition to the standards and guidelines outlined in HCP Section 1.2.3.4, Plum Creek's road management will include the following:

- a. Construct roads to minimum specifications to discourage high use, but to maintain safety and protect environmental conditions;
- b. locate roads, where practical, to avoid wetlands, ridgetops, saddles, or creek bottoms since these areas often are used by grizzly bears as feeding and travel corridors;
- c. reduce sight distances using "doglegs" or "crooks";
- d. minimize construction of "loop" roads since they encourage recreational usage;
- e. schedule construction to avoid seasonal use by bears; and
- f. identify temporary roads and landings that will be closed and replanted with conifers following harvest operations.

Some of the provisions of this BMP would be implemented in prior to verification. Watershed analysis and the riparian and wetland strategies, together with the Environmental Principles would likely influence the locations of new roads, and removal of some old roads, so that there would be fewer miles of roads in many sensitive areas in the future. Some habitat categories (e.g., wet meadows and avalanche chutes) would be avoided specifically for grizzly bears beginning prior to verification. Berry fields which are likely to be important for grizzlies would also be avoided whenever practicable. Similarly, saddles are often the most environmentally sound alternative for crossing a ridge with a road. Crossing in other locations might have severe impacts for species relying on talus slopes or other important special habitat type, or might increase the length of roads to avoid steep slopes and mass-wasting sites. Plum Creek may consider establishing priority areas should some Federal designation effort be initiated. In the meantime, Plum Creek would use its own discretion regarding road location relative to most grizzly bear habitat. For these reasons, the Service assumed that avoidance of habitats (other than wet meadows and avalanche chutes) would not occur until after the verification of successful denning or sightings of an adult grizzly with cubs.

3) Cover - Cover is an important habitat consideration for grizzly bears especially in areas of recreational and/or administrative use. Effective cover: (1) Allows bears to move between foraging areas and seasonal ranges; (2) Reduces mortality risk; and (3) Provides for thermal regulation. In all watersheds in the Planning Area, Plum Creek will maintain riparian habitat areas and other vegetative corridors which will effectively conceal bears. Particular attention will be given to maintaining vegetative cover areas adjacent to openings in order to facilitate bear movement around clearcuts and feeding areas within openings. Vegetative cover will also be provided in and adjacent to preferred habitats (such as low-elevation riparian areas, wetlands, avalanche chutes, and wet meadows) and adjacent to open roads. In addition, suitable vegetative cover will be distributed throughout the

watersheds in the Planning Area, and estimates of total cover available to bears will be calculated based on all ownerships within the Planning Area.

4) Size of Openings - Research on grizzly bears has shown that bears select edge or cover/no-cover interfaces. This preference is attributed to high forage values and proximity to escape cover. However, use of open areas by bears has been found to decrease as distance to vegetative cover increases. For this reason, Plum Creek will design even-aged and seed-tree harvest units within the I-90 Lakes Subunit (Grizzly Bear Recovery Zone) so that no point in the unit is more than 600 feet from effective hiding cover for bears. Areas suitable for application of this BMP include harvest units near preferred habitat and stands with understory conifers and shrub vegetation appropriate for overstory removal or other partial harvest treatments. Areas unsuitable for application would include stands near human habitation (e.g., cabins, campgrounds) where bear use is not prudent or where forest stands lack understory development and only highly valuable, merchantable timber would otherwise be retained. By following this strategy, Plum Creek will increase forest-edge opportunities for bears and other wildlife, maintain bear habitat effectiveness, and allow bears to take maximum advantage of adjacent vegetative cover. Although configuration of harvest units to provide cover is a post-verification BMP, in certain critical areas and on an experimental basis, Plum Creek may decide to configure some harvest units similarly prior to verification to develop an understanding of how to provide this level of security.

5) Timing of Operations - Seasonal timing of timber-harvesting operations is an effective means for Plum Creek to minimize bear/human confrontations and to maximize the effectiveness of important bear habitat (e.g., riparian corridors, avalanche chutes), Plum Creek will coordinate timber-harvesting operations in time and space so that activities will occur in areas and at times that have the least biological importance to the bears. For example, activities will be scheduled to reduce the possibility of disturbance to bears in denning habitat and areas identified as important foraging areas. Important foraging areas include low-elevation riparian areas and ungulate winter ranges in the spring (i.e., April through May) and areas where shrub-fields and fruit/nut sources exist at higher elevations in the late summer and fall. In those portions of the I-90 Lakes Subunit identified as spring foraging habitat, Plum Creek will schedule harvest activities to commence after June 1. In those portions of the Subunit identified as late-summer/fall grizzly bear habitat, forest activities will be scheduled to commence in winter or early spring, where practical.

6) Riparian Habitats - Riparian areas are among the most important habitat types for grizzlies for foraging opportunities and cover/movement corridors. Maintenance and protection of RHAs is part of Plum Creek's Riparian Management Strategy (HCP Section 3.3), and the Company will institute silvicultural prescriptions that provide habitat for a wide variety of wildlife species including grizzly bears. Management prescriptions for RHAs (HCP Section 3.3.3) specify selective uneven-aged harvest techniques in or near riparian zones that will maintain forage habitat for bears while retaining vegetative cover values.

Even though the Recovery Zone (I-90 Lakes Subunit) is the only area included in Plum Creek's grizzly bear management strategy, the Recovery Zone boundary does not impose an obstacle to grizzly bear movement into other areas of the Planning Area. In the event that grizzly bears are detected (by either Plum Creek or the Services) inside or outside of the Recovery Zone, but within the Planning Area, Plum Creek will, to the extent practical and within the Company's forest-management plans, implement temporary road closures or other temporary measures to minimize the potential for human/bear conflicts.

The HCP should avoid the take of bears. If bears become resident in the Planning Area, the additional provisions to be implemented should further ensure their ability to survive and reproduce in this geographic area. Any take expected would be minimal and in the form of disturbance.

GRAY WOLF

The wolf has flexible habitat requirements. Wolves require an adequate food supply, suitable denning and rendezvous sites, travel corridors, and regulation of disturbances caused by humans (USFWS 1987). Many endangered species face extinction because certain characteristics leave them vulnerable to disruptions caused by humans. This is not the case with wolves, which have high reproductive rates and flexible habitat needs (Wise et al. 1991), and they appear to be relatively unaffected by forest-management activities, such as timber harvest and silvicultural prescriptions. Roads, on the other hand, can have significant effects upon wolves. The major causes of the decline in wolf populations in the lower 48 States have been trapping, poisoning, and shooting as well as reduction in prey abundance (Mech 1970). Wolves are found only where conditions will support an adequate prey base, comprised primarily of ungulates. Habitat for wolves consists primarily of an adequate supply of vulnerable prey (ideally in an area with minimal opportunity for exploitation of wolves by humans) (USFWS 1984).

Pups are born in early spring, usually in an underground den, abandoned beaver lodge, or hollow log (Peterson 1986). Typically, dens are located on south or southwest aspects of moderately steep slopes in well drained soils (or rock caves), at elevations less than 200 meters above the surrounding low-lying area, and usually within 200 meters of surface water (Mech 1970). Some den sites may receive traditional use by a wolf pack from year to year. Most wolf packs appear particularly sensitive to human disturbance near den sites and may, depending upon the extent of the disturbance, abandon the den (USFWS 1984). After 6 to 10 weeks pups are moved from the dens to rendezvous or post-denning sites. Rendezvous sites are best described as resting, feeding, or activity sites occupied by wolves during summer and early fall months (Kaminski and Boss 1981). These sites usually include small (i.e., one acre or less), secluded bogs or complexes of meadows and adjacent hillside forests, in proximity to surface water (Weaver 1978). Rendezvous sites are also characterized by matted vegetation in the meadow, a system of well used trails through the adjacent forest and resting beds adjacent to trees in the forest (USFWS 1984). At this time, pups are unable to hunt and must remain at rendezvous sites where adults return with food. Wolves typically use two to three rendezvous sites while raising the young.

Provided that adequate food is available, wolves adapt readily to a variety of habitats and climates. One of the primary management requirements for encouraging wolf recovery is promoting and maintaining adequate ungulate populations through controlling access and habitat improvement. Another management activity that can benefit wolves is restricting human activity around active dens, especially just prior to whelping and in the first few weeks after birth.

Measures described in the HCP to avoid adverse impacts to the gray wolf consist of the following:

- > Den Site Protection: In the event that wolves den on Plum Creek's land in the Planning Area during the Permit Period, Plum Creek will restrict forest-management activities within a 0.25-mile radius of an active den site during the denning period (i.e., April 1 through June 15). The purpose of this restriction is to minimize disturbance near a den site which might contribute to den-site abandonment. Plum Creek will coordinate all activities planned for the area within 0.5-miles of active dens with the Service to determine if potential adverse impacts would occur. Additional road closures will be considered near dens to further protect the site. Known rendezvous sites will be protected. Management activities in a management unit containing a den site will be deferred for a period of 2 years following the last known denning. However, deferrals will be limited to a maximum of three historic den sites at any one time during the Permit Period and if greater than three active den sites occur at any one time, Plum Creek will consult with the Service to determine priorities for protection in the least burdensome, but most effective manner. These requirements are considered to be interim for the Planning Area and will be re-evaluated and reduced if six wolf packs are documented in Washington.
- > Provisions for Prey Habitat Conditions: Habitat management for wolves is primarily directed at habitat for its prey species. The most important prey species for wolves in the Planning Area are deer, elk, and snowshoe hares. These prey species are grouped under Lifeform 5, as species which use edges between forage (i.e., stand initiation; shrub/sapling; and young forest) and cover habitats (i.e., older forest types). The creation and maintenance of edge habitat through forest management activities (e.g., harvest units) will provide adequate habitat for wolf prey species, although, as discussed in HCP Section 3.2.2.5, primary habitat for Lifeform 5 species may decline slightly from current levels during the Permit Period.

The Service believes that the amount of edge as a sole indicator for the health of Lifeform 5 species is useful but does not convey all the relevant information. The amount of land within a half mile of a distinct edge between two stands may indeed decrease under the HCP with attempts to maintain spotted owls and other late-successional species. However, the decrease expected to occur over the first 50 years is relatively small. Currently, about 86 percent of the Planning Area is within half a mile of a distinct edge, by 2045 this is predicted to decrease to 62 percent. The Service believes this will still provide sufficient edge for healthy elk and deer populations. In addition, the Service notes that elk and deer requirements for sufficient cover, the value of mature forests as foraging habitat late in the growing season, the value of security and thermal cover, as well as the reduction in vulnerability, will all be met under the HCP. The availability of quality forage and hiding

cover contribute to the year-round distribution of deer and elk; during some times of the year, elk often seek larger, more-secure, blocks of cover. Elk and, to a lesser extent, deer also show preferences for moist sites during portions of the year, such as spring parturition and lactation periods and later summer/fall. The Service believe that many of the special habitat provisions for wetlands and forested wetlands, as well as provisions to avoid road-building near meadows during the spring in the grizzly bear Recovery Zone and avoid road-building across meadows year-round will benefit elk. The Services further note that many of Plum Creek's innovative silvicultural applications will provide within stand structure that will likely enhance the use of early-seral stages by deer and elk, as well as other wildlife.

- > Road Management: Plum Creek will increase road management to provide more secure conditions for both prey species and wolves that use the available habitat. Minimal contact with humans has been cited as the second most important biological necessity for wolf recovery. Plum Creek has been involved in many cooperative road closures with the Forest Service, WDFW, and DNR, to restrict vehicular traffic to maintain or increase big game security and manage hunting pressure. An important area for cooperative road management is the Taneum Creek watershed where Plum Creek has established hunting season road closures on major roads controlled by Plum Creek. The Taneum Creek watershed is also the area where most of the historical and recent sightings of wolves in the Planning Area have been recorded. Plum Creek will maintain these closures and increase road-management efforts in the future. Ungulate fawning/calving and wintering areas are areas where wolves are most likely to occur. To the extent possible, Plum Creek will schedule forest-management activities to occur at times of the year when wolves are least likely to be present. These actions should also provide additional protection against displacement and death of wolves due to poaching and malicious shooting. Road management for grizzly bears in the I-90 Lakes Subunit will provide similar protection benefits for wolves.

Roads and their associated disturbances can reduce the availability of surrounding habitats for wolf prey. It is estimated that habitat effectiveness for elk is reduced to one-half when there are about 2 miles of road per section. Lyon (1979) found that 3 miles per section removed virtually all effective habitat for elk in Montana. Other researchers have documented year-round avoidance of areas near roads. These effects however are very interrelated with the effects of local and landscape levels of cover. Road closures in conjunction with larger blocks of contiguous hiding cover, have been shown to be important in reducing vulnerability of elk, particularly large males. Road densities may be of more importance where hiding cover is a limiting factor. The Services believe that Plum Creek's commitment to obtaining open road density targets of 1.0 miles per section within the grizzly bear Recovery Zone (28 percent of the Planning Area) and to conduct Watershed Analysis, to reduce road construction where economically and operationally possible, and to close or decommission roads where feasible to address watershed concerns and habitat requirements for grizzly bears, wolves, and other species included in the HCP, will provide for the needs of elk and deer, and subsequently for wolves.

In addition, implementation of the riparian management strategy (HCP Section 3.3) will provide structural diversity and potential travel corridors for wolves to move, unimpeded across Plum

Creek's lands to adjacent Federal lands. Company directives to contractors restricting firearm possession in road closure areas and grizzly bear security areas provide additional protection for wolves in the Planning Area.

Even through implementation of the aforementioned measures, the possibility remains that wolves could be adversely affected as a result of the project proposed. A 0.25-mile buffer around an active den site may not be adequate in all cases to ensure that wolves would not abandon a den site. In addition, State regulations define the denning period as March 15 through July 1. The HCP specifies protection within 0.25 miles of den sites from April 1 through June 15, the expected denning period at this latitude, and requires Plum Creek to consult with the Service before conducting activities within 0.5 miles at any time of year, which will provide additional protection.

Effects on wolves is expected to be minimal. Life requisites should be adequately met and impacts from disturbance should be minimal. Overall, the Service expects that prey populations will remain healthy, a variety of forest stands will be present to support prey as well as provide hiding cover for wolves, and road densities will be reduced in the most critical areas for wolves. Road densities would not likely be addressed in the absence of the HCP.

BALD EAGLE

Bald eagle nests in the Pacific Recovery Area are usually located in uneven-aged stands with old-growth components, and are near water bodies which support an adequate food supply. Most nests in the Pacific Northwest are predominantly within coniferous stands. Nest trees usually provide an unobstructed view of an associated water body and are often in prominent locations on the topography. The tree selected for nesting is characteristically one of the largest in the stand or is at least co-dominant with the over story. Forests with suitable nest and perch trees are critical to bald eagle populations. Perpetuation of timber stands both within occupied and unoccupied habitats will be necessary to maintain current populations and reach recovery goals.

Bald eagles are particularly intolerant of human disturbance during the breeding season. Human activities have caused abandonment of nests and have resulted in reproductive failures. In some cases, eagles may have relocated their nests to avoid excessive disturbance. Eagle tolerance of human activity varies between individuals. In general, adult eagles are more sensitive to disturbance during courtship, egg-laying and incubation, and their sensitivity decreases as young develop.

Wintering eagles in the Pacific Recovery Area perch on a variety of substrates; proximity to a food source is probably the most important factor influencing perch selection by bald eagles. Favored perch trees are invariably located near feeding areas, and eagles consistently use preferred branches. Most tree perches selected by eagles provide a good view of the surrounding area.

Habitat requirements for communal night roosting are different from those for diurnal perching. Communal roosts are invariably near a rich food resource (i.e., runs of anadromous fish, high concentrations of waterfowl) and in forest stands that are uneven-aged and have at least a remnant of the old-growth forest component.

During winter, eagles in the Pacific Recovery Area are primarily associated with open water or major streams containing anadromous fish. Isolation is an important feature of bald eagle wintering habitat. Most eagles wintering in Washington are found on river systems in the Puget Trough, on the Olympic Peninsula, along the outer coast and Strait of Juan De Fuca, or on the Columbia River Basin. In addition, wintering eagles, normally in smaller numbers, are found at low elevations along streams and rivers on the east side of the North Cascades crest.

A cooperative Site Management Plan as required under the Washington State Bald Eagle Protection Rules (WAC-232-12-292) will be developed whenever Plum Creek's forest-management activities are proposed near a verified bald eagle nesting territory. Each Site Management Plan will be designed using the flexible, territory-zoning concept developed by WDFW (Stalmaster 1987), to avoid disturbing eagles, particularly during the critical nesting (January 1 through August 15) and wintering periods (November 1 through April 1). Bald eagle site-protection plans will not only include nest sites as required; but, in addition, will also include associated foraging areas and pilot trees. Winter concentration areas and communal roost sites will be protected from disturbances during the season of use.

It is not expected that a large number of eagles either winter or nest within the Planning Area. However, it is reasonable to expect that bald eagles may be impacted if the proposed action, through disturbance or habitat removal, resulted in bald eagles avoiding or abandoning a nest, night roost, or winter concentration area. Through the combination of riparian protections, contribution to maintenance of healthy populations of prey fish, and avoidance of disturbance, the HCP should contribute to the survival and recovery of bald eagles.

PEREGRINE FALCON

American peregrine falcons nest almost exclusively on cliffs, usually near water. Physiographic characteristics of nesting cliffs are currently being studied, but the data have not yet been completely analyzed. Preliminary results indicate that the most preferable sites are sheer cliffs 150 feet or more in height. The cliff usually has a small cave or overhung ledge large enough to contain three or four full-grown nestlings. Several holes or ledges that can be used in alternate years are apparently not an absolute requirement but probably increase the suitability of the cliff. Peregrines have nested from near sea level to over 11,000 feet, anywhere suitable cliffs are found except in the desert.

Associated with the nest territory is a foraging area. This generally includes wooded areas, marshes, open grasslands, coastal strands, and bodies of water. Wooded areas near water attract a diverse avifauna, and bodies of water provide open areas where prey cannot easily escape attack. Marshes, savannahs, and shorelines are also common foraging areas. Loss of foraging areas through adverse modification of habitat may also be a problem. Little is known of the winter habitat needs of peregrines along the Pacific Coast. Apparently, some adults remain near the nest cliff year round. Some breeding adults, as well as birds of the year and unpaired adults, may range more widely than during the breeding season.

In many areas human encroachment has caused nests to be abandoned, but it is difficult to separate the effects of habitat loss from the effects of disturbances to the birds themselves. The peregrine falcon is particularly sensitive to disturbance near the nest cliff during the breeding season. The effects of disturbances vary with their timing and proximity to the aerie. Many disturbances are tolerated quite well during the non-breeding season. However, in early spring during courtship, disturbed birds are particularly liable to desert an area. If human activities are centered generally throughout the nesting area, the entire territory may be abandoned, and the pair may not nest.

Disturbances near potential peregrine nesting and foraging habitat or destruction of those habitats may adversely impact peregrines. Measures described in the HCP to avoid adverse impacts to the peregrine are as follows:

- 1) To protect the nesting breeding and foraging habitat of the peregrine falcon, Plum Creek will implement the State Forest Practices Rules and Regulations which regulate activities in areas that federally listed species may use for nesting or breeding;
- 2) Plum Creek will implement the recommendations outlined in the Pacific Coast Recovery plan for the American Peregrine Falcon (U.S. Fish and Wildlife Service 1982) where appropriate for site-specific management;
- 3) Protocol surveys (Pagel 1992) will be performed prior to timber harvest or road building within 400 meters of a potential aerie (i.e., a rock cliff with a vertical face greater than 150 feet);
- 4) If a nest site is determined to be active, Plum Creek will restrict all forest-management activities within 0.5 miles of the site from March 1 through July 30;
- 5) Forest-management activities will be restricted within 0.25 miles of an active nest site at all other times of the year; and
- 6) Protection afforded RHAs, wetlands, and other riparian areas will maintain suitable foraging habitat for peregrines.

The HCP considers that peregrines usually nest on cliffs greater than 150 feet in height although, in at least one instance, they have been known to nest on smaller cliffs. The peregrine nesting/breeding season can extend from January through August, depending upon the elevation of the site. Forest-management activities within 0.5 miles of an active nest site between March 1 and July 30, the most-likely nesting season in this area. The combination of wetland buffers for protection of prey, and the protective measures to be implemented in association with nesting areas should contribute to the peregrines ability to establish and maintain breeding sites within the Planning Area.

INTERRELATED AND INTERDEPENDENT EFFECTS

Regulations implementing Section 7 of the Act require the Service to consider the effects of activities that are interrelated with and interdependent on the proposed Federal Action (50 CFR 402.02). The regulations define interrelated activities as those projects which are part of a larger action and depend upon the larger action for their justification, and interdependent activities as those projects which have no independent utility apart from the action that is under consideration. Both interdependent and interrelated activities are assessed by applying the "but-for test," which asks whether any action and its associated impact would occur "but for" the proposed action.

The issuance of the permit to allow the incidental take of owls, murrelets, grizzly bears, and wolves will allow Plum Creek to conduct normal timber-management activities and related activities. This will include the construction, maintenance, and decommissioning of roads; cutting, limbing, yarding, and hauling of logs; entry by silviculturalists, wildlife biologists, foresters, and management, enforcement, and other personnel for miscellaneous activities such as inventory, monitoring, assessments, land surveys, boundary and tree marking, and general reconnaissance; fertilization and spraying of herbicides and pesticides; and maintenance of gravel pits, telecommunication towers, and administrative facilities. The primary (and perhaps the only) connected action related to the Services issuing a Permit to Plum Creek would be an increase in harvests on Plum Creek land in a pattern different from the No-action Alternative. The actions under the HCP would not follow the 1.8-mile owl circle protocol and Plum Creek could harvest a greater area of forest than the No-action Alternative. These constitute the primary interrelated effects.

Interdependent actions may occur on adjacent lands, and may include the actions of road construction for access and the associated removal of habitat along the road corridor. The Service has assumed that every portion of the Project Area is accessible and available for harvest. Some areas may be harvested with the aid of a helicopter, but the Service did not assume any area was limited to this type of an operation. Road access across Federal lands (the predominant lands interspersed with Plum Creek especially in unaccessed areas) will require the issuance of a Forest Service permit and would thereby be a Federal action subject to Section 7 analysis. With the HCP, Plum creek may have greater flexibility regarding where it can harvest and therefore may not need to access unroaded areas or may not need to build as many miles of road. Because the HCP facilitates land exchanges, it could be assumed that, as Federal land is consolidated, less access would be required across Federal lands. For this analysis, we assumed that every acre would be accessed with retention of the current landownership pattern.

The actions of timber harvest (with its resulting loss of habitat due to removal, modification, or degradation), road construction (including the degradation of habitat values due to the presence of roads and the density of roads), and related disturbances have already been considered in the above sections of this biological opinion for the owl, murrelet, bear, wolf, eagle, and falcon.

CUMULATIVE EFFECTS

Cumulative effects, as defined in 50 CFR 402.02, include the effects of future State, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this Section because they will require separate consultation pursuant to Section 7 of the Act. Several Federal landscapes and their current condition and management direction are described to help place other surrounding actions in context.

Cumulative effects analysis addresses the effects of the proposed action and other reasonably foreseeable actions at the regional level. Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

With or without the HCP, Plum Creek would request easements from the Forest Service for construction and use of roads across National Forest land necessary to access isolated portions of Plum Creek land. Plum Creek request for easements, construction of roads, and harvest of their lands are expected to be the same with or without the HCP. The EIS and HCP covered Plum Creek lands (169,177 acres) and a substantial area of adjacent lands owned by the Federal government (201,800 acres) and others (41,000 acres). Because of the checkerboard pattern of ownership, the EIS and HCP analyzed the impacts of the Alternatives for the entire Planning Area (418,690 acres) over the proposed Permit Period. The analysis addresses management (harvest) activities for each alternative, and for each landowner over the Permit Period, regardless of ownership. Thus, the EIS and HCP analysis, far from being a narrow and short-term analysis, is an inclusive, long-term analysis and by its design addresses cumulative effects for habitats, species of concern, and other aspects of the human environment.

In addition to the Planning Area, activities likely to take place on surrounding lands were analyzed, in a general sense, for cumulative impacts. Many of the areas discussed are depicted in Figures 1 and 2 of the EIS. In order to assess the cumulative effects of actions occurring on nearby and adjacent lands during the term of the proposed Plum Creek HCP several broad assumptions were made. For Federal lands, these are explained in Section 2.6.5 of the HCP. Assumptions regarding other nonfederal ownerships were that standard nonfederal forest management consistent with applicable Federal regulations and State forest practice rules would continue. This assumption was made in spite of the fact that several HCPs are currently in development by other nonfederal landowners. Those HCPs were too preliminary to make detailed assumptions with confidence, but should be better for wildlife, including owls, than the assumptions which were made about State and Federal regulatory minimums.

WILDERNESS AREAS

As described earlier under Environmental Baseline, the Alpine Lakes Wilderness is located in the north central portion of the Planning Area and extends to the north and east of the Planning Area. Norse Peak Wilderness is immediately to the south of the Planning Area and just to the north of the William O. Douglas Wilderness. The Clearwater Wilderness is located to the southwest of the Planning Area. Management activities will be virtually absent from these areas in terms of forestry and land management. Impacts will be primarily from dispersed recreation. Wilderness areas are often popular backpacking and horseback riding areas. Isolated locations with particular aesthetic qualities are often used intensively which results in soil compaction, trampling of wetlands, intense grazing, burning of woody debris for firewood, and use of local sources of drinking water by people and horses. In general though, most Wilderness areas will be maintained in a natural condition and will provide habitat for a wide range of species, including late-successional species.

NATIONAL PARKS

As described earlier under Environmental Baseline, Mt. Rainier National Park is located to the southwest of the Planning Area and is maintained in a relatively pristine condition. Large portions of this area are in high-elevation forests or are non-forested. Campgrounds and trails are found within the Park, but dispersed recreation is more strictly regulated than in most wilderness areas. Tourism (e.g., sight-seeing and photography) and education are the primary activities. The North Cascades National Park is north of the Planning Area, but is too distant to be considered for this analysis.

FOREST SERVICE LANDS

As described earlier under Environmental Baseline, there are considerable amounts of forest lands outside the Planning Area. Late-Successional Reserves are found to the east of the northern portion of the Planning Area in the Teanaway drainage, to the southwest between the Clearwater Wilderness and the Norse Peaks Wilderness, and to the south and east of the Planning Area along with managed late-successional lands. The Snoqualmie Pass Adaptive Management Area is found within the Planning Area and abuts the Alpine Lakes Wilderness area to the north. These lands will be managed with the objective of creating and maintaining late-successional habitat. Matrix lands are found within the southeastern and western portion of the Planning Area, as well as outside and to the south of the central portion of the Planning Area. These National Forest lands, in conjunction with other Federal lands, completely bound the north, south, and northeast of the Planning Area. These lands will be managed in a very conservative manner and would contribute very little to impacts.

MUNICIPAL WATERSHEDS

The City of Seattle lands are located within the Cedar River Drainage. It is expected that because of the responsibilities as the municipal watershed for the City of Seattle, that management will be more conservative than typical forestry operations and will contribute to the conservation of wildlife and late-successional forests. Potential impacts may include manipulation of waterflow and fish passage. The City of Seattle is pursuing an HCP with the Services, if completed, it will be subject to additional Section 7 consultation.

The City of Tacoma lands are located above Howard Hanson Reservoir adjacent to the Green River and major tributaries in the Green River Drainage. Tacoma owns little forest lands; their primary ownership is mainly riparian areas. Other forestry-oriented ownerships occupy most of the watershed. The City of Tacoma, because of its watershed responsibilities, is expected to manage conservatively, but will likely utilize timber harvest as a land-management practice. Other potential effects include a proposal to raise the Howard Hanson Dam which will convert stream-side habitat into reservoir. Activities and access in both municipal watersheds are restricted to protect water quality.

OTHER FORESTRY LANDS

Both King and Kittitas Counties have identified areas through their County Planning Process (see Land Use -- EIS Section 3.2) that are expected to be managed as forests for the foreseeable future. It is assumed that current management would continue on these lands.

The L.T. Murray Wildlife Management Area is managed by the Washington Department of Fish and Wildlife (WDFW) as wildlife habitat. The timber rights are privately owned and harvest could occur along with other associated activities. The WDFW manages the area primarily for the benefit of wildlife.

The Washington Department of Natural Resources (DNR) owns several sections and partial sections within and adjacent to the Planning Area. Their harvests may be governed by internal policies. While forestry management may be more conservative than in the past, timber harvest will be comparable to some other areas within the Planning Area. Under a proposed HCP for DNR, most DNR parcels within the Plum Creek HCP Planning Area have been proposed to either serve a dispersal or a nesting, roosting, foraging habitat role. Riparian buffers proposed also approximate those proposed by Plum Creek and being implemented as part of the Aquatic Conservation Strategy on Federal lands. Should an HCP be approved it would be subject to additional Section 7 consultation.

Boise-Cascade owns timber lands in the Teanaway Drainage. These lands have been managed over many years. Historically, uneven-aged or selective-harvest have comprised the majority of their harvests. These practices are expected to continue. The Weyerhaeuser Company owns lands on the west side of the Cascade crest. Normal forestry practices on the West Side include greater use of

even-aged harvests. Land exchanges with the Federal government have been occurring in this area and it is expected that there may be additional exchanges in the future. As lands are acquired by the Federal government, they would be managed in accordance with the Northwest Forest Plan. In the central portion of the Planning Area, south of I-90 and Kachess Lake, Plum Creek lands are intermixed with other ownerships, including DNR, Boise-Cascade, and small private ownerships practicing various levels of forestry.

The forestry-oriented lands, in conjunction with the municipal watersheds, State wildlife areas, and Federal lands, surround most of the Planning Area with the exceptions noted below. Forest activities, if properly conducted, have temporary impacts because stands return to a forested condition, allow natural processes to continue, form no permanent barriers to wildlife, and are less severe than many other development activities. The Yakima Resource Management Cooperative is a voluntary organization of Federal and State agencies, private landowners, Tribes, and environmental organizations on the east side of the Planning Area which strives to achieve landscape goals through cooperative processes. This effort will likely continue and will likely be effective at identifying and minimizing many cumulative impacts. Also, lands east of the Cascade crest are more amenable to uneven-aged management, thereby further reducing the impacts from forestry operations.

NON-FOREST LANDS

The County Planning efforts in each County have identified lands which are unlikely to be managed for forestry in the foreseeable future. These include an area from Cle Elum to the south end of Kachess Lake excluded from the Planning Area and, to a lesser degree, an area in the Snoqualmie Drainage near the town of North Bend (EIS Figure 1). These areas, which are not likely to be managed exclusively for timber production in the near future, may be subject to activities such as housing developments, commercial activities, and recreational developments. These activities will have greater impacts on many aspects of the human environment and wildlife than would have occurred as a result of forestry. Further, as a result of the shape and location of these areas, in conjunction with the natural constrictions in the shape of the mountains in these areas, the general pattern of the remaining forests is a rather dramatic "hour-glass" shaped land pattern. This naturally occurring shape restricts the north/south and east/west movement of organisms. The constriction in the contiguous forest lands, and the areas of development along I-90, may hamper the movement of many organisms, especially smaller, less-mobile species. Management of adjacent forested lands may alleviate or exacerbate this problem, but cannot overcome this problem.

Other effects of this development may include reduced air quality from woodstoves and automobiles, greater demands on the municipal water supplies, intensive recreational activity, and increased traffic. Widening of I-90 in some areas to create additional lanes may become necessary in the foreseeable future.

AGRICULTURE AREAS

Agricultural areas to the east of the Planning Area in the Yakima Valley also contribute to the cumulative impacts. One of the primary impacts is the demand placed upon the water supply. Diversions are made from streams to provide for irrigation. Some streams are temporarily dewatered during critical periods. Reservoir expansions to increase storage capacities are being considered, as are additional reservoirs. These measures would result in loss of terrestrial habitat and further modification of aquatic habitats. Additional instream structures may also prevent fish passage. Many of these factors are addressed in the limiting factors analysis (Toth 1995).

TRANSPORTATION AND COMMUNICATIONS

Expansion of I-90 to create additional traffic lanes may occur during the Permit Period. Without attention to wildlife crossings and provisions, this will further aggravate the connectivity problems for low-mobility species. For instance, the ability of Pacific fishers to successfully cross highways is inversely proportional to the width of the highway and is greatly reduced on highways wider than 60 feet. Construction of elk fences along I-90 to the east of the Planning Area not only inhibits the movements of elk to their traditional winter ranges, but also inhibits the movements of other large mammals.

The Moses Lake Airport is the alternate airport for SeaTac Airport south of Seattle. Airports in and around the Seattle/Tacoma metropolitan area may have limited ability to expand. Within the foreseeable future, it is not unreasonable to assume that the Moses Lake Airport will serve a larger role in regional transportation. This would place greater ground transportation pressures (e.g., automobile or train) on the I-90 corridor.

The Burlington Northern Railroad line may be reopened across Stampede Pass to connect the town of Yakima with Western Washington lines. This would result in possible alterations to stream-side habitat, brush-clearing, and potential spills and fires. A petroleum product pipeline may be constructed across Snoqualmie Pass using and abandon railroad right-of-way. A recent proposal regarding a fiber-optic cable is also in the early stages of consideration. Power-transmission lines are cleared (non-forested) linear corridors crossing Snoqualmie Pass through the Planning Area, and connect the hydro-electric projects on the Columbia River with markets in Western Washington. These powerlines may also have effects on migratory birds. Communication towers are also present in and around the Planning Area.

RECREATION

The demands for winter recreation may impact almost any lands in the Planning Area, as well as the surrounding areas, that are open to public use. This impact will be mainly along roads and trails. However, such activity is concentrated around Snoqualmie Pass, existing ski areas, and several snow park areas. These areas may either expand or contract during the Permit Period. One potential

expansion might include a destination resort in the Gold Creek area. This again, would have additional impacts upon connectivity and late-successional habitat. The unused Milwaukee Railroad line has been converted into a series of hiking trails. These trails pass through tunnels along the route which disturbs bats using those tunnels for roost sites. Most recreation, and therefore disturbance may be focused along roads or established trails. Dispersed recreation may also have impacts in all four seasons of the year. It is expected that impacts from backpacking, hunting and fishing, and other nonmotorized forms of recreation will have minimal impacts. Motorized recreation will more easily contribute to disturbance and the inability of individuals of some species to utilize all habitats that would otherwise be available to them.

FORESTED HABITATS

With regard to cumulative effects, the major biological issue within the Planning Area is the continuing loss of old-growth forests and the effect of this loss on effective patch size of late-successional and old-growth forest (fragmentation), on the loss of effective migration and dispersal conditions within continuous riparian and forest landscapes (connectivity), and the decline in health of the aquatic systems and the surrounding riparian areas upon which they depend. The Northwest Forest Plan will result in most of the National Forest land in the Planning Area being managed for late-successional and old-growth forests characteristics (USDA and USDI 1995). Since these problems can not be addressed only upon National Forest land, the treatment of nonfederal lands within the checkerboard ownership plays an important role determining success of the Northwest Forest Plan in the Planning Area and upon cumulative effects.

Forest Service lands may provide fairly large patches, especially as time progresses, but would still be limited by natural and human-induced breaks in vegetation patterns and the checkerboard ownerships. Generally, the largest patch that the National Forest could manage would be 640 acres. In many cases, nonforested habitat and/or prior harvests reduce old-growth patch size below 640 acres. Land exchanges are likely in the future. Such exchanges would allow the Forest Service to "block-up" its ownership and establish larger patches of older forests as well as establish connective corridors. The HCP would not preclude land exchanges in the future. In addition, forest cut in the past decades are maturing and during the Permit Period should provide stands of sufficient stature to buffer late-successional forests and reduce or eliminate edge effects between forests and nonforest units.

The ROD for the Northwest Forest Plan (USDA et al. 1994) recognized the SPAMA as a "*critical connective link in the north-south movement of organisms in the Cascade Range.*" The linkage has two attributes: (1) Provisions of more or less continuous habitat corridors; and (2) the size of habitat patches in and adjacent to corridors. The SPAMA Team (USDA and USDI 1995) observed that "*the distribution and size of forest patches is essential to the intent of the ROD*" to "*maintain a functional, interactive, late-successional and old-growth forest ecosystem.*" With smaller patches of late-successional forest there is more "*edge effect and less effective late-successional habitat due to reduced interior forest.*"

One objective of the Riparian Conservation Areas (RCAs) on Federal land is to establish a system of interconnecting habitat corridors. This strategy fails to accomplish its purpose on checkerboard lands where only alternate sections will be protected by a stream-side corridor (i.e., RCAs) (USDA and USDA 1995) and nonfederal land is harvested under current State regulations.

The Northwest Forest Plan will establish RCAs along streams, thus leading to a system of riparian corridors. Plum Creek proposes RHAs in its HCP which complement the RCAs. Other private and State ownerships are assumed to provide smaller more intensively managed buffers which may result in additional impacts such as a dearth of large woody debris, excessive water temperatures, and increased amounts of siltation. The DNR and the City of Seattle may also propose comparable stream-side measures in future HCPs. Other HCPs have, or will likely, propose stream-side protection measures that complement the Federal RCAs resulting in a region-wide system of stream-side corridors in the foreseeable future. That would only improve conditions above the level assumed in this opinion.

Two aspects of forest-health have major implications for cumulative impact. Both fire risk and the potential for insect damage increase during the Permit Period in the Planning Area (HCP Figures 49-54). Both of these factors increase because of the maturation of the forests and current fire-protection measures. This trend within the Planning Area is shared with other areas, especially east of the Cascade crest, where forests are maturing and accumulating fuels. Thus, in the absence of any change in management direction, forests in the Planning Area, and National Forests can be expected to have increasing risks of catastrophic fire and/or insect damage.

Stand-structural classes were analyzed for each decade. The HCP should not result in any major change in late-successional and old-growth forests in the Planning Area over the Permit Period. This apparent stability is due to combinations of non-declining old-growth on National Forest and Plum Creek lands, as well as maturation of forests on National Forest and Plum Creek land. Furthermore, approximately 60 percent of Plum Creek land is either non-habitat, non-forested, or in early-successional stages that would not become harvestable before the end of the Permit Period. Of the owl habitat (NRF and FD) in the Planning Area, approximately 27 percent is outside of owl circles (EIS Table 25). Of the owl habitat on Plum Creek land within owl circles, 18,100 acres are either core restricted or share restricted, the remaining 31,800 acres are unrestricted. Only 4 percent of the 418,690 acre Planning Area would be relieved from restrictions under this plan.

Northern Spotted Owls

Based upon Irwin and Hicks (1995), the current carrying capacity in the Planning Area is 87 pair sites (HCP Table 26). Nesting, roosting, and foraging spotted owl habitat (NRF) is presently estimated to be 28 percent of the Planning Area, while foraging/dispersal habitat (FD) is estimated to be 20 percent of the Planning Area (EIS Table 13). As a result of implementation of this HCP and projected management scenarios on adjacent ownerships, NRF habitat would be 26 percent of the Planning Area and FD habitat would be 35 percent of the Planning Area at the end of the Permit Period based on habitat models (EIS Table 13).

Cumulatively, Federal reserves and supplementation from nonfederal lands while Federal conditions improve will provide sufficient habitat to sustain owl populations in the Planning Area. NRF to support a projected number of 80 owl pairs in the Planning Area will exist at year 2045 and throughout the remainder of the Permit Period. While this represents a slight reduction in the projected current potential of the area to support viable, productive sites, the loss will be spread over several years or decades and should not be large enough to jeopardize the species at the local, regional, or range-wide levels. The projected number of owl sites would exceed the level projected by the final draft Recovery Plan.

In addition, connectivity across the Planning Area should be enhanced through a combination of Federal-management guidelines and the reduction in landscape-level 'non-habitat' areas expected to result from implementation of the proposed HCP. Improved landscape connectivity will mitigate for the slight potential population reduction and allow remaining owl clusters and habitat reserve areas to function more effectively as an interconnected system and enhance long-term viability of the regional owl population.

Several factors or deviations from the assumptions of this analysis may result in effects more negative than those described above. These factors include: adoption of a State owl rule less protective than current regulations or inconsistent with conservation objectives for nonfederal lands in the Planning Area; widespread loss of habitat due to catastrophic forest fires, infestation, or disease; and, widespread displacement of spotted owls by barred owls. The effects of these potential actions are currently not quantifiable but could be expected to result in loss of habitat and occupied owl sites, reductions in the viability of population clusters and increased demographic isolation of remnant population clusters. Implementation of the proposed Plum Creek HCP may increase the likelihood of catastrophic events occurring or the severity of impacts upon occurrence. Unfortunately, given the current state of knowledge, a paradox exists: managing for additional mature forest with structure increases the risk of losing these habitats. One of the goals of adaptive management will be to learn how to manage NRF habitat for owls without increasing the risk of fire, insect infestation, or disease.

Marbled Murrelet

The Service has designated critical habitat for the marbled murrelet. Approximately 5,228 acres are within Critical Habitat Units (CHUs) in the Planning Area on Forest Service lands (LSR) in the Green River Watershed. None of the designated lands are owned by Plum Creek. The Forest Service will likely manage designated lands, both in and outside of the Planning Area to provide murrelet nesting habitat.

The HCP would not cause significant adverse cumulative effects on marbled murrelet populations in the Planning Area or on regional population viability. This conclusion is based on the small amount of suitable nesting habitat on Plum Creek land in the Planning Area and the lack of nesting activity observed to date. Impacts to murrelets from the HCP, should they occur, would be less likely on the east side of the Planning Area and murrelets outside the Planning Area are unlikely to be affected. Murrelets only depend on forested stands for nesting (and some predator evasion) but

not foraging. However, additional impacts outside the Planning Area may result from actions taken in the marine environment.

Effects of the proposed action to marbled murrelets range-wide are relatively minor because: (1) Marbled murrelet populations in the area are small, at best, relative to other parts of Zone 1; (2) The loss of occupied habitat or take of individual birds will be minimized; and (3) Continued provision of habitat on west-side LSRs in the Planning Area with the proposed critical habitat on those Federal lands. Because of the continued implementation of the Northwest Forest Plan, the impacts of the HCP are likely to be minimal on the ability of the marbled murrelet population to recolonize and persist in the action area.

Grizzly Bear

A reproducing grizzly bear population does not appear to exist in the Planning Area though isolated observations indicate that grizzly bear may recolonize the Planning Area during the Permit Period. A portion of the Planning Area is within the designated Recovery Zone. That portion of the planning Area is found within the I-90 Lakes Subunit.

The proposed HCP would implement Plum Creek's Environmental Principles, establish RHAs, and implement BMPs for bear protection and habitat improvement (including road closures). Thus, the Proposed Plan would enhance habitat conditions for grizzly bears. These measures combined with other regional efforts would have beneficial cumulative effects for bears. Beneficial BMPs would include protection and provision of special habitat features used by grizzly bears such as, wet meadows, shrub fields, wetlands, and riparian areas, limiting human activity that may disturb bears, and providing foraging, resting, and dispersal opportunities spatially distributed in the landscape (i.e., provision for wildlife species and plant communities that are food items and vegetation structure for other life-history requirements. Plum Creek's I-90 Lakes Subunit and intermingled Forest Service land are the southern-most portion of the North Cascades Recovery Zone. There is no requirement to maintain connectivity to the south, and in fact, presence of bears south of I-90 is not recommended in the Recovery Plan (U.S. Fish and Wildlife Service 1993).

The proposed HCP, in conjunction with State and private actions expected to occur would not cause any significant adverse cumulative effects on grizzly bear populations in the vicinity of the Planning Area or on regional population viability. Intense or concentrated recreation will preclude bear use of some areas. Dispersed recreation can also be a source of disturbance and conflict which may lead to direct mortality of bears. High road densities on adjacent lands and the private and State lands interspersed within the Planning Area but outside the Recovery Zone are likely to impact grizzlies should they become established. Conditions to the north of the Planning Area appear promising for bears. Areas to the east and the west become less conducive to bear use with greater distance from the Recovery Area.

Gray Wolves

Resident wolves have not been documented in the Planning Area though several unconfirmed sightings have been reported. Wolves may permanently colonize portions of the Planning Area during the Permit Period. Recovery Areas for wolves in Washington have not yet been identified. Currently, the WDFW is determining the status of wolf populations in Washington.

The HCP would implement Plum Creek's Environmental Principles, prioritize road-management efforts where wolves are residing, create RHAs, and implement BMPs for grizzly bears. All of these measures would enhance habitat conditions for gray wolves in the Planning Area and would complement RCAs, road closures, and other measures implemented on National Forest lands, and provide benefits above levels provided by the No-Action Alternative. Beneficial measures would include protection of big game prey in areas where wolves are residing, efforts to prevent malicious shootings, and protection of den sites from forestry-related practices during the denning season. Maintaining an adequate prey base is probably the most important factor for successful recolonization of wolves. Road closures and habitat management protect and/or enhance conditions for prey species, including deer, elk, and snowshoe hare. Wolves may also be impacted from areas adjacent to the Planning Area, particularly to the east of the Planning Area and within ungulate winter ranges. Interstate 90 and adjacent development may create a deterrent to north-south movements.

Bald Eagle

Only one eagle nest is known to occur in the Planning Area. It will be affected mainly by actions on Forest Service and Plum Creek lands. These impacts are expected to be minimal. Disturbance of foraging and roosting eagles is more likely. This area is used heavily for recreation. Fishing and boating, which naturally are focused on larger, fishbearing streams, are likely to disrupt feeding from time-to-time. Harvesting operations may also disrupt foraging. Winter communal roosting may be affected from both disturbance and loss of habitat. Disturbance due to harvesting or winter recreation is likely where roost sites are unknown. Where roost sites are known, harvesting on Federal, State, or Plum Creek lands will likely avoid the area surrounding roost sites or the season of use.

Peregrine Falcon

Peregrine falcons are not known to occur within the Planning Area, but possible nesting habitat does exist. The effects of harvesting on cliff-nesting habitat is expected to be minimal. Habitat management surrounding wetlands is expected to provide adequate prey habitat across most ownerships. Cliff-based recreation may provide a potential source of disturbance or nest destruction. Few effects upon peregrines are expected to result from timber-management activities within and around the Planning Area.

CONCLUSION

After reviewing the current status of northern spotted owl, marbled murrelet, grizzly bear, gray wolf, bald eagle, and peregrine falcon; the environmental baseline for the action area; the effects of the proposed plan; and the cumulative effects; it is the Service's biological opinion that the issuance of the ITP, and execution of the IA implementing the proposed HCP are not likely to jeopardize the continued existence of the aforementioned species, and is not likely to destroy or adversely modify designated critical habitat. Critical habitat for the owl and murrelet has been designated; however, this action does not affect any of those areas and no destruction or adverse modification of that critical habitat is anticipated.

Should Plum Creek request that any of the other species covered by the HCP and IA be added to the incidental take permit, the Service will reinitiate Section 7 consultation for those species.

BIOLOGICAL OPINION

It is the biological opinion of the Service that implementation of the proposed HCP is not likely to jeopardize the continued existence of the northern spotted owl, marbled murrelet, grizzly bear, gray wolf, bald eagle, or peregrine falcon. The timber-harvest activities are expected to adversely affect the owl, murrelet, bear, and wolf; and incidental take of individual owls is likely to occur within acceptable levels.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act, as amended, prohibits taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. ***Harm** in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. **Harass** in the definition of "take" in the Act means an intentional or negligent act, or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.* Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

This incidental take statement applies only to four listed species: the owl, murrelet, grizzly, and wolf. Should Plum Creek request that bald eagles, peregrine falcons, or any of the currently unlisted

species be added to the permit, formal consultation under Section 7 of the Act will be reinitiated, at which time a definitive incidental take statement would be issued for the species, provided the proposed action is in compliance with Section 7(a)(2) of the Act.

The measures described below are non-discretionary, and must be implemented by the Service so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in Section 7(o)(2) to apply. The Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Service: (1) Fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, and/or (2) Fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

AMOUNT OR EXTENT OF TAKE

Northern Spotted Owl

The Service is required to use the best scientific and commercial data available when reviewing actions under Section 7 of the Act. These data suggest that risk of take may be avoided if at least 40% suitable habitat within the median home range (1.82-mile radius circle in the Planning Area) of single residential owls or pairs of owls is maintained, at least 500 acres of suitable habitat is retained within 0.7 miles of an owl's nest or activity center, and at least 70 acres of the best suitable habitat is retained within the core area of a nest site or activity center. In this analysis, the Service used several methods to estimate take (Attached Appendix 1).

The Service anticipates that incidental take (harm) attributable to the proposed actions would result from the loss of suitable owl habitat within the estimated home range of resident owls or owl pairs (a 1.82-mile radius circle in the Washington Cascades Province) to an amount that is less than 40% of their home range (approximately 2,663 acres). The Service also anticipates that incidental take attributable to the proposed actions would result from the loss of suitable habitat to below 500 acres within the 0.7-mile radius of the nest site or activity center. Studies indicate that sites with greater than 500 acres of suitable habitat within a 1,000 acre area (0.7-mile radius) are more likely to be occupied than areas with less than 500 acres. An analysis in the USDI 1990 Status Review using Forest Service monitoring data of randomly selected 1,000-acre sites, showed that the average number of owls/site, the number of pairs/site, and the number of young/site all increase steadily as the amount of older forest increases. The Service also expects some take through loss of 70-acre cores resulting from harvest of habitat.

Loss of habitat and potential increased fragmentation, together with the legacy of past harvesting on this landscape, may result in increased predation and competition and reduce the ability of the owls to reproduce successfully. Given that many of the owl sites currently have less habitat than what is usually believed to be the minimum required to avoid take, the Service has determined that issuance

of a permit will create a likelihood of injury to the owls by harming them to such an extent as to significantly disrupt their normal behavioral patterns such as breeding, feeding, or sheltering. Project implementation would likely result in "take" as defined in the Act.

As a result of the analyses described earlier in this document, the Service estimated that, under the worst-case scenario, all of the estimated impacts might result in take. Additionally, we do not believe that it will be possible to differentiate Plum creek Timber Company's contribution to these impacts from those of other land-managers in all cases. The Service believes it is appropriate to consider that this HCP may result in that larger level of take as opposed to just the incremental difference. These considerations are reflected in the estimates provided below.

Based on the best information currently available on spotted owl use of the project area, we anticipate the harm of up to 83 owl sites (≤ 166 owls) as a result of proposed timber-harvest activities within 1.8 miles or 0.7 miles of site centers over the course of 100 years according to the schedule in the Attached Table 4.

The Service also anticipates that incidental take attributable to the proposed actions would result from the loss of suitable habitat within the 70-acre core surrounding nest sites or activity centers. Based on the best information currently available on spotted owl use of the project area, we do not anticipate the harm of additional owls beyond those already identified above.

The Service expects incidental take in the form of harassment to be minimal. As an additional precaution, road building and timber harvest will be restricted near known nest sites during the breeding season. Project-specific surveys and owl-monitoring surveys will continue to identify many of the resident owl pairs.

The total take expected as a result of the proposed action is 83 owl sites. Of these sites, many are not pair sites, and instead are either unoccupied, occupancy is questionable, or they are occupied by resident singles. The distribution of that take will likely be skewed toward the earlier years of the HCP. Under the permit, Plum Creek will be authorized to take all northern spotted owls associated with activities conducted under the HCP.

Marbled Murrelet

There is a potential of incidental take in the form of harm and harassment of marbled murrelets associated with the harvest of up to 400 acres of unsurveyed suitable habitat west of the Cascade Crest and 1,400 acres of habitat east of the Cascade Crest. Only a small fraction of this habitat is likely to be actually occupied by marbled murrelets, further reducing the potential for take.

Grizzly Bear and Gray Wolf

Based on the analysis of impacts provided above, the Service anticipates that take of the grizzly bear and gray wolf may occur as a result of the proposed HCP in the form of harassment with no direct

mortality expected. However, take to the species is expected to be avoided or be of minor significance, when all measures included in the HCP are implemented.

The estimated number of grizzly bears that may be taken as a result of the project is from one to three individuals. This would include one male, one female, or one female with two cubs. The estimated number of wolves that may be taken is from one to eight animals (an average pack of wolves is normally around eight animals).

The rationale for the above estimates is similar for all four species. Take is expected to be avoided; but, if it occurs, only a minimal number of individuals would be affected. Wolves and bears occur infrequently at best; and, should disturbance occur, it would be rare. Therefore, the number of individuals likely to be present in a group and subject to disturbance at any one time is presented as an estimate for the number of individuals which may be taken. More than one case of take from disturbance is unlikely.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined, for the following reasons, that this level of anticipated take is not likely to result in jeopardy to these species or the destruction or adverse modification of critical habitat.

Northern Spotted Owl

Take in the form of harm and harassment may occur. Unknown sites may be subject to timber-harvest during the breeding season or to associated disturbance. Known sites may be subject to habitat removal which may inhibit their ability to survive and reproduce. Sufficient amounts and quality of habitat are expected to be present to provide owls with an opportunity to maintain their numbers within the Planning Area at or above critical levels.

It is the Service's opinion that a small loss of habitat across the landscape (<10%), and the subsequent potential decline in numbers of individuals within the Planning Area (<10%), is within acceptable levels. This corresponds to a small percentage of the 1,113 owl sites found within the State of Washington.

Marbled Murrelet

The risk of take of significant amounts of murrelet habitat is low. The most-likely-to-be-occupied sites on the west side of the Crest are being surveyed. Future harvest might impact murrelets but only if additional murrelet habitat is provided. The amount of murrelet habitat expected to persist on Plum Creek lands west of the Crest after the surveyed habitat is harvested is uncertain. Future sites would most likely occur on Federal lands. Take would most likely occur in the form of disturbance or indirect effects due to harvesting of adjacent or nearby stands. Disturbance is expected to be minimal where occupied sites are known.

Grizzly Bear and Gray Wolf

It is acknowledged that take, in the form of harassment (disturbance), may occur to these species within the Planning Area. However, no direct mortality to the grizzly bear or gray wolf is expected to occur as a result of the action. The Service's determination was based on the protection and benefits the species would receive through implementation of the measures provided in the HCP.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take:

1. Any incidental take of (species) must comply with all the terms and conditions of the Section 10(a)(1)(B) permit (including the provisions of the Implementing Agreement and the HCP) to ensure that conservation measures included to protect the various species are properly implemented.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the Act, the Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary.

1. A Section 10(a)(1)(B) permit, as evaluated in this biological opinion, must be issued by the Fish and Wildlife Service. The Implementing Agreement for the Habitat Conservation Plan for the Section 10(a)(1)(B) permit must be agreed to by the Fish and Wildlife Service and the permit conditioned upon implementation of the Habitat Conservation Plan and the Implementing Agreement.
2. The Service has provided a protocol for the handling of dead, injured or ill listed species for pesticide analysis. When the Service suspects a species has been taken in violation of label restrictions, the incident(s) shall be reported to the Division of Law Enforcement or their designee in the Region in which the species is found. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement: Assistant Regional Director; Division of Law Enforcement; 911 N.E. 11th Avenue; Portland, Oregon 97232-4181; (503) 231-6125

Notice: While the incidental take statement provided in this consultation satisfies the requirements of the Endangered Species Act, as amended, it does not constitute an exemption from the prohibitions of take of listed migratory birds under the Migratory Bird Treaty Act.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service offers the following conservation recommendations:

1. The Service should provide technical assistance to Plum Creek throughout the term of the permit.
2. The Service should provide technical advice on monitoring and other biological issues associated with implementation of the HCP.
3. The Service should conduct regular compliance monitoring and review the periodic reports.
4. The Service should assist Plum Creek in coordinating with surrounding landowners, particularly the U.S. Forest Service.
5. When the Service is notified that an area that may be suitable for use by bald eagles for communal night roosting may be subject to harvest, the Service should survey that area for bald eagle use prior to harvesting. Surveys should be carried out when bald eagles would be expected to use the area. The bald eagle wintering activity period extends from October 31 through March 31.
6. The Service should review progress made by Plum Creek and provide advice regarding updates and improvements to inventory data, including understory composition, downed woody debris, snags, and standing defective trees; and corresponding updates to the stand structure and composition data.
7. At the time of proposed listing, the Services should solicit public and scientific comment on the addition of that species to applicable incidental take permits which include unlisted species agreements in the Federal Register notice of proposed listing.

In order to document actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service shall provide, in writing, reports of the implementation of any conservation recommendations at the time of the periodic reporting. The variances from the recommendations may be reported instead.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) A new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Item 2 above, regarding new information, could include deviations from the Northwest Forest Plan. Should such deviations occur to the extent that the baseline is significantly altered or the integrity of the HCP and its assumptions are compromised, consultation would be reinitiated.

If you have any questions regarding this biological opinion, please contact William Vogel of my staff at the letterhead phone/address.

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DESCRIPTION AND RATIONALE OF ANALYSIS METHODS

INTRODUCTION

The impacts attributable to the HCP are the incremental differences between the No-action Alternative and the proposed HCP. Because other ownerships were modeled identically between alternatives, the incremental differences reflect the impact of implementing the HCP on Plum Creek lands.

No-Action Alternative

Given the assumption that the number and location of owl sites remain constant and that the amount of restricted habitat on Plum Creek's land would also remain constant, the No-action Alternative includes projected amounts of habitat over the Permit Period. However, there is no guarantee that owl sites will not decrease or increase in number, or that the amount of habitat currently restricted would remain restricted in the future.

Should owls perish or move, and their sites subsequently become vacant, the habitat contained within those sites would become available for harvest, ultimately resulting in a decrease in the amount of habitat provided under the No-action Alternative. It is not likely owls would increase in number and establish additional sites. To reduce the potential for increased harvest restrictions due to prohibitions against take, suitable unoccupied habitat would be harvested prior to occupation and unsuitable timber stands would be harvested prior to becoming suitable owl habitat. In addition, where the 40-percent threshold is met at occupied sites, substitution of younger, more-marginal habitat for older habitat is possible, further reducing the quality of habitat available. The assumption that owl sites remain static and that the amount of restricted habitat remains constant is therefore a conservative assumption; thus, a "worst-case" scenario.

Proposed HCP

Under the proposed HCP, in contrast with the No-action Alternative, there is a guaranteed amount of NRF habitat (HCP Table 26). However, under the proposed HCP, timber harvest would occur within owl "circles". Deferrals of greater than or equal to 2,600 acres of NRF for 20 or more years would be used to ameliorate impacts, FD deferrals, additional landscape levels of FD habitat with dispersed patches of NRF habitat would be provided, seasonal protection from disturbance would be afforded known sites, and a gradual prioritized entry would occur when owl sites are entered for timber harvest. Additional deferrals would be employed, or deferrals extended or relocated, should monitoring indicate that owl sites are substantially below predicted levels.

RATIONALE

Timber harvest within owl circles is a potential source of take. The Service generally differentiates between Harm and Harass as forms of take. ***Harass** in the definition of "take" in the Act means an intentional or negligent act, or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.* This is often referred to as disturbance in this Opinion. ***Harm** in the definition of "take" in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering.* The methods used in this opinion focus on estimating harm which may result from habitat modification and degradation, as effects of harassment are expected to be minimal..

Habitat Definitions

In the Cascade Mountain Range in Washington, the Service considers owl sites at risk of take if less than 50 percent of a 0.7-mile radius surrounding the site center, or less than 40 percent of a 1.82-mile radius are in "suitable" habitat. "Suitable" habitat is generally defined as habitat which contributes nesting, roosting, and or foraging. It does not normally connote habitat which merely provides a dispersal function. Habitats which provide nesting functions include those habitats considered as "Old Forest" by the SAG (Hanson et al. 1993) which includes both Type A and Type B habitats. This is synonymous with the "Superior" habitat described in the ISC Report (Thomas et.al. 1990).

In Western Washington, "Submature" (Hanson et al. 1993) is defined as habitat which provides all of the necessary characteristics for roosting, foraging, and dispersal, and does not normally provide for nesting. This habitat corresponds to the better Type C habitats. In Eastern Washington, "Submature" habitat includes a wide variety of stands, does provide nesting function, and generally corresponds to the Type B habitat and to some habitat previously considered Type C. "Young Forest Marginal" habitat (Hanson et al. 1993) provides for some of these functions, but corresponds to the low- and mid-range Type C habitats.

Type A, B, and C are the most widely used paradigm due to the recognized requirement of habitat protection in State Forest-practices regulations. However, this system provides no classification for forest serving a dispersal function, is difficult to derive from timber-inventory data, and has not been applied consistently for Type C habitats. In the Plum Creek HCP, those habitat types which provide a nesting, roosting, and foraging function are referred to as NRF habitat. Those which merely provide for foraging and dispersal are referred to as FD habitat (Hicks and Stabins 1995). These do not exactly match the definitions of the SAG, or those commonly used by the Service and the WDFW. NRF roughly corresponds to Type A and B, and the higher-quality Type C habitat. FD corresponds to the remainder of Type C habitat and some of what was previously classified as nonhabitat but is potentially suitable for some dispersal

functions (e.g., some areas above 5,000 feet elevation used by owls). In Washington State, the Service has come to rely on the tracking system and definitions used by WDFW. Regulatory circles are generally assessed based on the amount of Type A, B, and C habitats. Additional information on home range size and habitat use in the Planning Area can be found in Hicks et. al. (1995).

Because only a portion of the Type A, B, and C habitats are given "credit" as NRF habitat in this analysis, and because the HCP uses a definition of FD which includes some habitat which is considered suitable nesting habitat (Type C) by other classification systems, the Service's analysis herein is a conservative analysis which should overestimate the amount of take and impact. In addition to the analyses done solely on the basis of NRF habitat, the Service also preformed a separate analysis for comparison purposes where the amounts of NRF and FD were both considered between the 0.7-mile and 1.8-mile radii. As in the NRF-only analysis described earlier, only NRF was considered within the 0.7-mile radius during this secondary analysis. For the purposes of this secondary analysis, it was assumed that higher-quality NRF habitat was required in proximity to the nesting site to provide an abundance of prey, but that FD habitat could support one or both members of the pair during other times of the year.

Decadal Intervals

Changes in habitat amount and distribution relative to owl sites for purposes of predicting take were analyzed at 10-year intervals. These intervals are of sufficient length that meaningful changes occur in the landscape as a result of timber growth and management. Use of decadal periods avoids the repetitive increments of impact that would be associated with a yearly analysis. A decade has biological significance because it roughly equates to one generation or life-span for spotted owls.

Site Importance

During the first 20 years of the proposed HCP, habitat within 20 "non-deferred" sites may be available for harvest; but, only 7 of these sites were occupied in 1994 and 1995 and only 4 sites produced young in 1994 and 1995. This means that the HCP may only impact 4 productive sites in the first 20 years. If the unoccupied sites are subjected to harvest first, and harvest within owl circles begins with least important habitat first, both as directed in the HCP, the impact can be further reduced by providing remaining sites time to benefit from regrowth of habitat or for owls to adjust their home range to accommodate gradually encroaching timber harvesting. The 30 sites which benefited from deferrals (28 of which are occupied) are less likely to be taken at the end of the 20 years due to growth of new habitat during those first 20 years. If these deferrals are phased-out or harvests are conducted in a gradual manner, many of these sites may persist well beyond the 20-year deferral period. It is, therefore, difficult to estimate the level of take that might occur during the Permit Period. Depending on the situation, the number of existing, occupied owl sites taken by Plum Creek could logically vary from fewer than 7 to more than 50. A prioritization process was presented for the owl sites in the Planning Area which indicated that significant impacts due to Plum Creek management actions was relatively unlikely for more than

50 sites due to sufficient amounts of habitat on Federal lands, lack of Plum Creek ownership within the circle, or location of the site center relative to Plum Creek ownership and other topographical features (Herter et. al. 1995).

Site-status Categories

Potential consequences of timber harvest which results in take include displacement of owls, reduction of productivity, and/or reduction in survival. Some "takes" are more severe than others. In some situations, where take has occurred, although impaired by reduction in habitat, the birds may continue to remain and reproduce or may adjust their home range to accommodate the harvest pattern. In other situations, this impairment may be such that occupation and productivity of those sites may no longer occur consistently, if at all.

Some sites which are taken below the 40- or 50-percent threshold levels would be subsequently taken to lower levels resulting in multiple takes of the same site; while other sites may improve their status. The Service desired a mechanism to deal with multiple takes at a meaningful level without confounding the take analysis with multitudes of incremental take on the same site. The Service also desired to distinguish between levels of impact; and, therefore, established 3 viability classes (J. Zisa, U.S. Fish and Wildlife Service -- Habitat Conservation Planning Team, pers. comm., 1995). Use of these viability classes allowed the Service to distinguish between levels of impact and to assess cumulative take as opposed to multiple increments of take. Reduction of habitat that would change a site from fully viable to slightly impacted is at risk of take but with less risk of impact than if a slightly impacted or fully viable site is reduced to severely impaired. For the purposes of this consultation, the Services refer to these situations as low, medium, and high risk of impact, respectively.

Impacts associated with a change in status from fully viable to slightly impacted are expected to be minor in comparison to a site reduced to the severely impaired level. Any site which becomes severely impaired represents a situation where take and impact are likely. If the site was fully viable at the beginning of the decade, the impacts may be more severe than if the site was slightly impacted. However, because significance of these impacts may be further related to whether the site was a pair site, consistently productive, strategically located (such as an area of few owl sites or in an area of dispersal habitat linking areas of better suitable habitat), and other such factors; the Service has combined the moderate and high risk of impact in much of the discussion and Figures within the biological opinion.

Dynamic Paradigm

Owl sites do not normally remain static. Some sites will shift locations over time through random movements or in response to changing habitat conditions. Some sites will not persist, other new sites will develop. This further complicates the estimate of take because additional owl sites may be subject to impact. Some new sites may develop and also be taken, some may be taken several times, or move and be taken again. For these reasons, the Service believed it was important to develop an analysis which could factor in the dynamic nature of owl sites,

more-accurately depict the amount of take, and provide greater insight into the true level of impacts resulting from the HCP. The Service developed a dynamic approach for estimating take which is described below.

To evaluate the take associated with the dynamic nature of owl sites, the Service used GIS information to conduct an analysis. The landscape was populated with hypothetical sites in year 0 (1996) (Attached Figure A-1) using an algorithm described later. The algorithm limited the sites to those which are at least fully viable or slightly impacted, and which are at least 3000 meters apart (corresponds to the approximate mean minimum distance between existing pair sites located within the project area). Then the landscape was "aged" until year 10 (2006), at which time the viability of those sites was reassessed based upon the year 10 habitat conditions for those sites (Attached Figure A-2). Changes in viability classes were noted. Results for both the No-action Alternative and the proposed HCP were compared. The hypothetical sites were erased and new hypothetical sites were generated based upon the year 10 habitat conditions (Attached Figure A-3). These steps were repeated until year 50 (2045).

Carrying Capacity

However, an actual estimate of take is far less important than the number of owls remaining over time. It therefore is necessary to view the habitat and resulting owl sites with consideration to the long-term effects. For instance, a plan which reduces the number of owls on the landscape may result in fewer owls taken over the long-term than another plan where sites are taken but persist at a constant or increasing number. From a conservation perspective, it is desirable to have more owls available to be taken at the end of a plan.

Use of the dynamic approach still does not account for the ability owls have to move their home range, use non-circular home ranges, and use a wide variety of habitat types. The true impacts associated with the HCP are related to the number of owls remaining throughout the permit period. The Service's crude estimate of carrying capacity from the allocation of generated sites produced during the take analysis was comparable to Plum Creek's RSPF model. The Service recognizes that the RSPF is considerably more sophisticated and, therefore, a portion of this analysis is based on the RSPF model (Irwin and Hicks 1995) for an estimate of carrying capacity through time.

Landscape-level Habitat Amounts

Carrying Capacity models are driven by habitat amount, quality, and juxtaposition. The Service believes that regardless of the models used, it is ultimately the habitat which will determine the carrying capacity. For that reason, the Service also assessed the amounts and changes in habitat across the Planning Area, within each NWFP landscape, and within each DCA. The Service also performed a qualitative assessment of the role of FD in providing connectivity, larger functional patch size, and in support of foraging and dispersing owls.

SUMMARY

The Service assessed take using existing sites and analyzing how they would fare by decade. Some of these sites are currently vacant, and some sites by the definition of this static approach could be taken multiple times. However, because owls are expected to respond to a changing habitat base by moving, abandoning, or establishing new sites, the Service also used the dynamic analysis described above. Many sites taken might remain because there was a small amount of impact. The Service employed a viability classification system to differentiate levels of impact resulting from the take. The most important issue is not the amount of take, but the remaining number of sites and their ability to function productively. Therefore, the Service relied in part on the estimates of carrying capacity provided by the RSPF model (Irwin and Hicks 1995) which is based upon a complex set of assumptions related primarily to habitat availability. In the final analysis, the determining factor for owls is the amount and distribution of habitat in the area. The Service assessed the amount and types of habitat remaining in the Planning Area and within the important landscapes within the Planning Area.

METHODS

All methods used owl habitat layers provided by Plum Creek covering the No-action Alternative and the proposed HCP for the years 1996, 2006, 2016, 2026, 2036, and 2045. Initial data on forest conditions were obtained from current inventories provided by landowners within the Planning Area. Future projections were based on current conditions, growth-and-yield data generated within the Planning Area, and the FIBRPLAN model for forest growth and management. The inventories covered the area encompassed by the Plum Creek Planning Area plus a 1-mile buffer. For spotted owls, the inventories identified four habitat classes: nesting, roosting, and foraging habitat (NRF); forage and dispersal habitat (FD); other forest; and non-forest.

Each inventory layer was converted to a 100-meter grid. A focal-sum function was used to determine the number of 100-meter pixels of each habitat class within a radius of 2,900 meters (approximately 1.82 miles) and 1,100 meters (approximately 0.7 miles) of each pixel in the grids. The classes, "other forest" and "non-forest" were grouped into a single class, "OTHER". The class, "NONSTUDY", was added to identify the amount of area within each radius falling outside of the inventoried area. The pixel counts for NRF, FD, and OTHER were calculated into percentages for each circle using the sum of the pixel counts for NRF, FD, and OTHER as the denominator of the calculation. This had the effect of extrapolating known information to the NONSTUDY areas encompassed by a circle.

A. TAKE was assessed using a 2-class viability ranking (above and below habitat thresholds).

Above threshold status: Those sites with 40 percent or more of the area inside a 1.82-mile radius and 50 percent or more of the area within a 0.7-mile radius classed as suitable habitat.

Below threshold status: All other sites.

Take: A change from the above threshold class to the below threshold class.

B. *IMPACT-RISK ASSESSMENT* involved defining sites as "fully viable", "slightly impacted", and "severely impaired" based on the following definitions developed by J. Zisa and W. Vogel (U.S. Fish and Wildlife Service -- Habitat Conservation Planning Team, pers. comm., 1995):

Fully Viable: Any site which meets one of the following criteria for amounts of suitable habitat:

1. 40 percent or more of the area inside a 1.82-mile buffer and 42 percent or more inside a 0.7-mile buffer.
2. 30 percent or more of the area inside a 1.82-mile buffer and 58 percent or more inside a 0.7-mile buffer.

Slightly Impacted: Any site not classed as fully viable but containing 30 percent or more suitable habitat within a 1.82-mile buffer and 42 percent within a 0.7-mile buffer.

Severely Impaired: Any site not classed as fully viable or slightly impacted.

C. *STATIC SITES:* Analyses were performed using the locations of the 107 known site centers as acquired from the Washington Department of Fish and Wildlife by Plum Creek. The data is current as of 1/1/94. The site centers were converted to 100-meter pixels and overlaid with each inventory grid to determine the percentages of suitable habitat available from each site center within 1.82- and 0.7-mile radii. Only those 96 site centers where 50 percent or more of both buffers were inventoried were kept in the analysis resulting in the exclusion of 11 sites.

The viability of each site was determined for the beginning and ending of various decades for both the No-action Alternative and the proposed HCP. The decades used for the impact-risk assessment were 1996-2006, 2006-2016, 2016-2026, 2026-2036, and 2036-2045 for both habitat-suitability definitions (NRF ONLY and NRF+FD). The decades used for the take analysis were 1996-2006, 2016-2026, and 2036-2045 and limited to a habitat-suitability definition of NRF only.

D. *COMPUTER-GENERATED SITE CENTERS:* This analysis assessed take and impact against sets of sites generated for each inventory layer. Identification of sites were based on the following criteria:

1. Sites must meet habitat-suitability requirements for fully viable or slightly impacted for the modified take analysis and above guidelines for the take analysis.

2. Be a minimum of 3,000 meters from any previously generated site, and
3. Have less than 50% of the 1.82- and 0.7-mile buffers in the NONSTUDY class.

The program randomly populated the landscape with sites meeting the fully viable definition until all possible sites were used. For sites being generated for the impact-risk assessment, it then made a second pass, populating the landscape with slightly impacted sites until no more possible sites were available.

Sites were generated for both alternatives. The decade and habitat-suitability definitions matched those used in the static site analysis.

DEFINITIONS FOR INTERPRETING RESULTS

A. TAKE ANALYSIS

Alternative: p = Proposed HCP, n = No-action Alternative

Decade: Beginning year of the decade

Radius: The minimum distance between computer generated sites. This is always 3,000 meters for generated sites, but is meaningless for static sites.

Nrfoption: Always nrf indicating nesting/roosting/forage definition of suitable habitat.

0 - number of sites falling out of the analysis because NONSTUDY class exceeds 50%.

11 - number of sites above thresholds at beginning and end of decade.

13 - number of sites above thresholds at beginning of decade but declining to below threshold at the end of the decade

31 - number of sites improving from below threshold at the beginning of the decade to above threshold at the end of the decade.

B. IMPACT-RISK ASSESSMENT

Alternative: p = Proposed HCP; n = No-action Alternative

Decade: Identifies the beginning year of the analysis decade. For example, the value, 1996, indicates the decade 1996 to 2006.

Radius: The minimum distance between computer generated sites. This is always 3,000 meters for generated sites, but is meaningless for static sites.

Nrfoption: Which habitat types were included in analysis.

nrf = nesting/roosting/foraging habitat defines suitable.

nrffd = nesting/roosting/foraging and foraging/dispersal habitat defines suitable.

0 - number of sites not analyzed. Indicates number of sites where the percentage of NONSTUDY is greater than 50 percent. This value is always zero for generated sites since a generation is constrained only to those possible sites where NONSTUDY is less than 50 percent. It is always 11 for static sites.

11 - number of sites which were fully viable at the beginning and end of the decade.

12 - number of sites which moved from fully viable to slightly impacted over the decade (low risk of impact)

13 - number of sites which moved from fully viable to severely impaired over the decade (high risk of impact)

21 - number of sites which improved from slightly impacted to fully viable over the decade

22 - number of sites which were slightly impacted at the beginning and end of the decade.

23 - number of sites which moved from slightly impacted to severely impaired over the decade (moderate risk of take)

31 - number of sites which improved from severely impaired to fully viable over the decade. For generated sites, this value is always zero since the program did not generate severely impaired sites.

32 - number of sites which improved from severely impaired to slightly impacted over the decade. For generated sites, this value is always zero since the program did not generate severely impaired sites.

33 - number of sites which were severely impacted at the beginning and end of the decade. For generated sites, this value is always zero since the program did not generate severely impaired sites.

total: The total number of sites. This value identifies the number of sites generated by the computer. For static site analysis it is always 96.

@risk: This is the sum of low, moderate, and high risk of impact (i.e. columns headed 12, 13, and 23) for the decade.

- stable:** Number of sites which experienced no change over the decade and were viable (11, 22).
- improved:** Number of sites which improved over the decade to a viable status (21, 32, 31).
- stable, impaired:** Number of sites which were severely impaired at the beginning and end of the decade (33).

DISCUSSION OF RESULTS

Tables A and B identify changes in site viability for the alternatives for both generated and static sites using the modified take approach. Tables C and D contain the results of the analysis using the guidelines of suitable habitat and take.

Occupancy Rates

Site occupancy is dynamic across the landscape as owls “sample” for suitable habitat, as conditions change from year-to-year, and owls are lost from and added to the population. In reality, site centers shift over the landscape and rarely remain “static” in time and space. Thus, of the 50 known sites that comprise the sites more likely to be impacted by the end of the Permit Period, some are currently unoccupied, and others would become unoccupied during the Permit Period. In addition, however, some of Plum Creek land currently without owl sites, may become occupied. Irwin and Hicks (1995) estimated that about 70 percent of the known owl sites would be occupied and productive during any one year. Their estimate of owl site carrying capacity includes this occupancy rate. Their RSPF model predicts 87 current sites, 88 sites in 2045 for No-Action, and about 80 for the action alternatives. This is a conservative estimate, because the RSPF model does not consider the amount and juxtaposition of FD habitat which may contribute to site center longevity and productivity. There are currently 107 known owl sites in and around the Planning Area. If 70 percent of them were occupied, there would be 75 productive sites.

Optimistic No-action Scenario

Aggressive surveys and decertification programs are always an option under this alternative. As many as 14 sites are likely candidates to receive 2 or more years of protocol surveys to document absence and could likely be decertified, releasing over 2,000 acres of habitat available for harvest. This was not considered during the assessment of impacts under the No-action Alternative (FEIS 1996). As additional sites are found to be vacant, habitat not encumbered by other overlapping owl sites would also be released. Where the 40-percent threshold is met, substitution of younger forest for older forest is possible, further reducing the quality of habitat available.

No-action Alternative Declines in NRF

The assumption that owl sites remain static and that the amount of restricted habitat remains constant is therefore a conservative assumption; thus, a "worst-case" scenario. If the impacts of the No-action Alternative are underestimated, the incremental impact of the HCP is overestimated; thus, assuming a "worst-case" scenario. Other apparent reductions in NRF habitat under the No-action Alternative may appear for the following reasons:

- > Habitat may be projected for harvest in circles below 40 percent NRF but above 40 percent Type A, B, or C.
- > There are 9 status 4 sites which are not enforced by the State.
- > There are 3 sites with altered configurations of the 1.8-mile "circle".
- > At least one site center has moved since the database was updated.

Estimate Comparisons

Using the viability classes developed for impact assessment, only 45 of the 107 known owl sites are currently classed as fully viable or slightly impacted when only NRF habitat is defined as suitable habitat; this increases to 51 sites when NRF and FD define suitable habitat. The number of computer generated sites for 1996 under the same scenarios are 76 and 97, respectively. Only 26 of the known sites are above the 40- and 50-percent thresholds for evaluating risk of take. Using those thresholds, 43 sites were generated by the computer using only NRF as habitat. Several reasons for this discrepancy exist: (1) Although of small amount, about 10 percent of the owl habitat in the Planning Area has not yet been surveyed; (2) Some patches of habitat may be isolated and have not been recolonized; (3) Some owls utilize noncircular home ranges; (4) some sites are vacant (Carrying Capacity does not equal population level); and (5) The GIS may have been very efficient at placing sites within the existing habitat in comparison to the selection exhibited by owls.

Two additional reasons exist for the discrepancy between predicted and observed numbers of owl sites. The Service's GIS assessment did not account for fragmentation. This was a component of the moving windows analysis used in the RSPF. The Service, in conjunction with WDFW, requested a fragmentation analysis performed as a test. The results of that analysis are presented in Appendix 2 of Technical Report 6 (Irwin and Hicks 1995) and is entitled Spotted Owl Nest Site Probability Model: Evaluating landscape Effects of Habitat Fragmentation. Additionally, the GIS exercise used 1.82-mile radii to assess habitat conditions. Irwin and Hicks (1995) determined that 0.7-mile radii provided the best ability to discern occupied from unoccupied sites.

Regardless of the fact that some possible owl sites may be vacant because of predation, competitive exclusion, or other factors, assessment of take or impact levels based upon an over estimate of sites which can be at risk of take or impact ensures a worst-case scenario. In relation to carrying capacity estimates, although our viability estimates indicate that few of existing sites would be fully viable or slightly impacted, there are currently at least 107 sites present in and around the Planning Area and over 60 of those are pair sites, many of which have consistently produced young in the past 6 years.

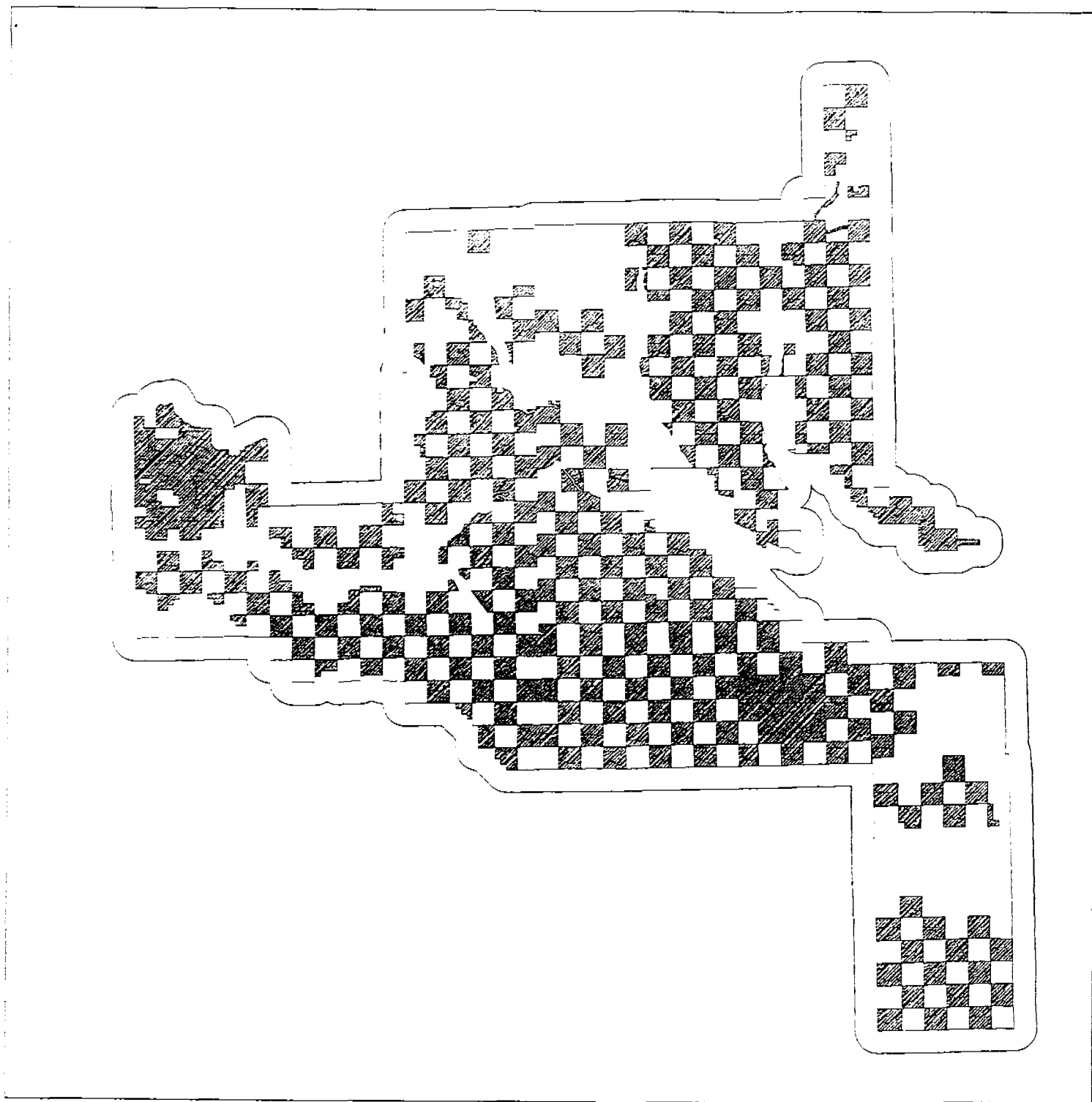
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- Figure 2. Marbled murrelet critical habitat in the Planning Area.
- Figure 3. Types of spotted owl habitat estimated for 1996 within a 1.8-mile radius of existing site centers.
- Figure 4. Types of spotted owl habitat estimated for 1996 within a 0.7-mile radius of existing site centers.
- Figure 5. Types of spotted owl habitat projected for 2016 within a 1.8-mile radius of existing site centers.
- Figure 6. Types of spotted owl habitat projected for 2016 within a 0.7-mile radius of existing site centers.
- Figure 7. Types of spotted owl habitat projected for 2045 within a 1.8-mile radius of existing site centers.
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- Table 2. NRF habitat as distributed across NWFP landscapes and DCAs.
- Table 3. Stand structure amounts on Plum Creek lands by Forest Class.
- Table 4. Schedule of projected take and impact for the northern spotted owl.



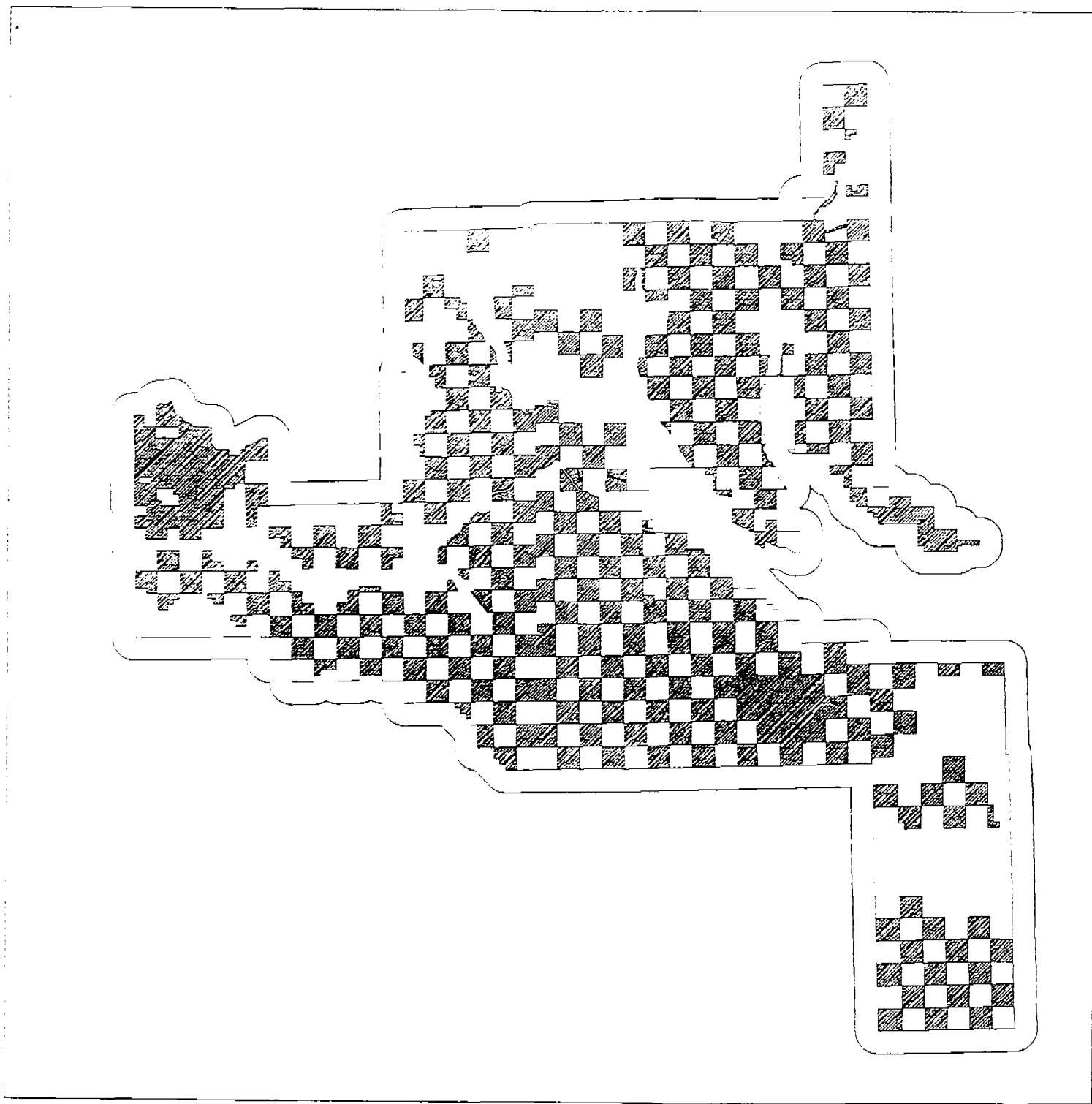
SPOTTED OWL CRITICAL HABITAT

0 2 4 6 8 10
MILES

Plum Creek Ownership
Designated Spotted Owl
Critical Habitat

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 16, 1994

Figure 1. Northern spotted owl critical habitat in the Planning Area.



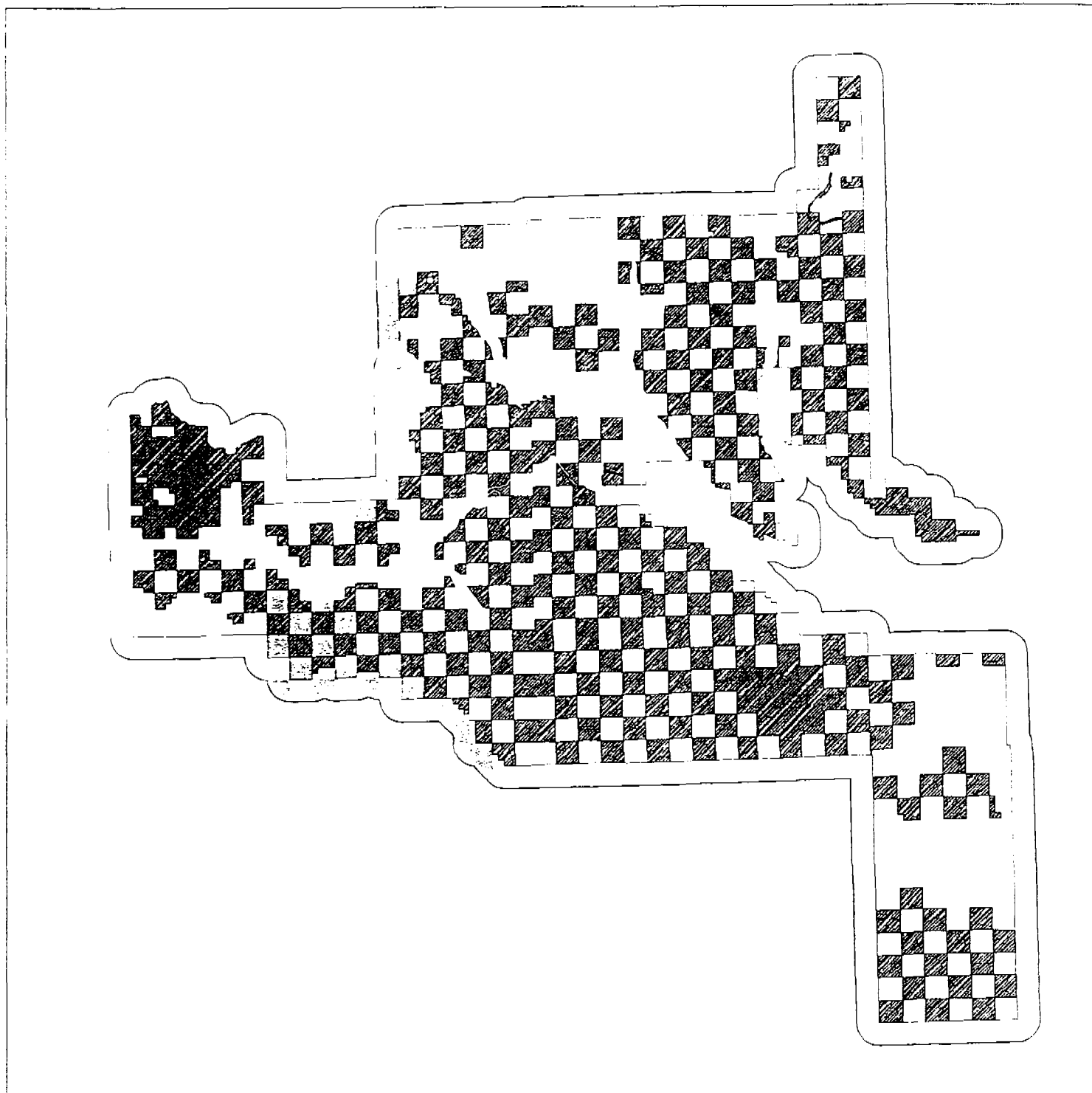
SPOTTED OWL CRITICAL HABITAT

0 2 4 6 8 10
MILES

Plum Creek Ownership
Designated Spotted Owl
Critical Habitat

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 10, 1996

Figure 1. Northern spotted owl critical habitat in the Planning Area.



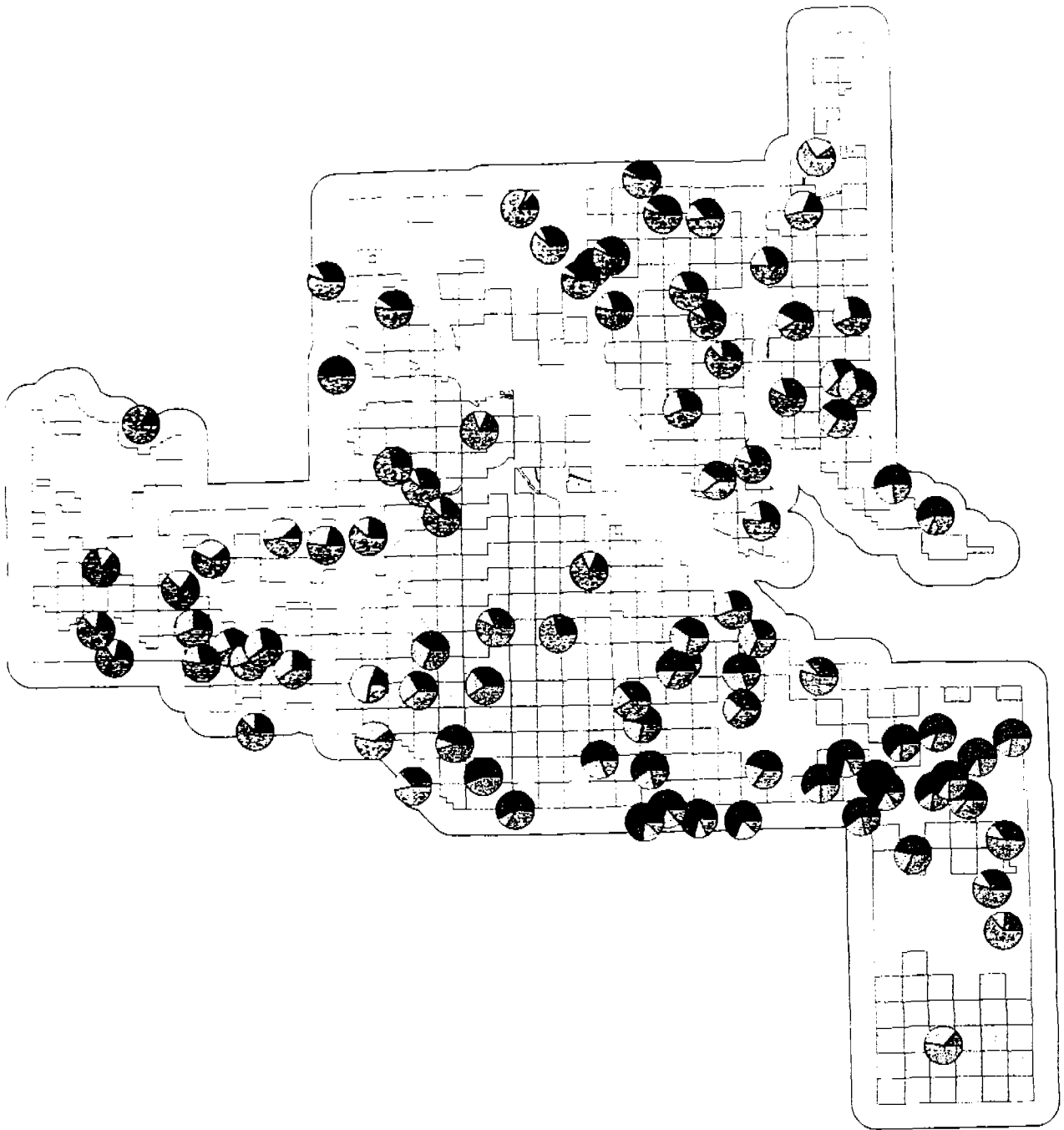
MARBLED MURRELET CRITICAL HABITAT

0 2 4 6 8 10
MILES

Plum Creek Ownership
Designated Marbled Murrelet
Critical Habitat

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 10, 1990

Figure 2. Marbled murrelet critical habitat in the Planning Area.



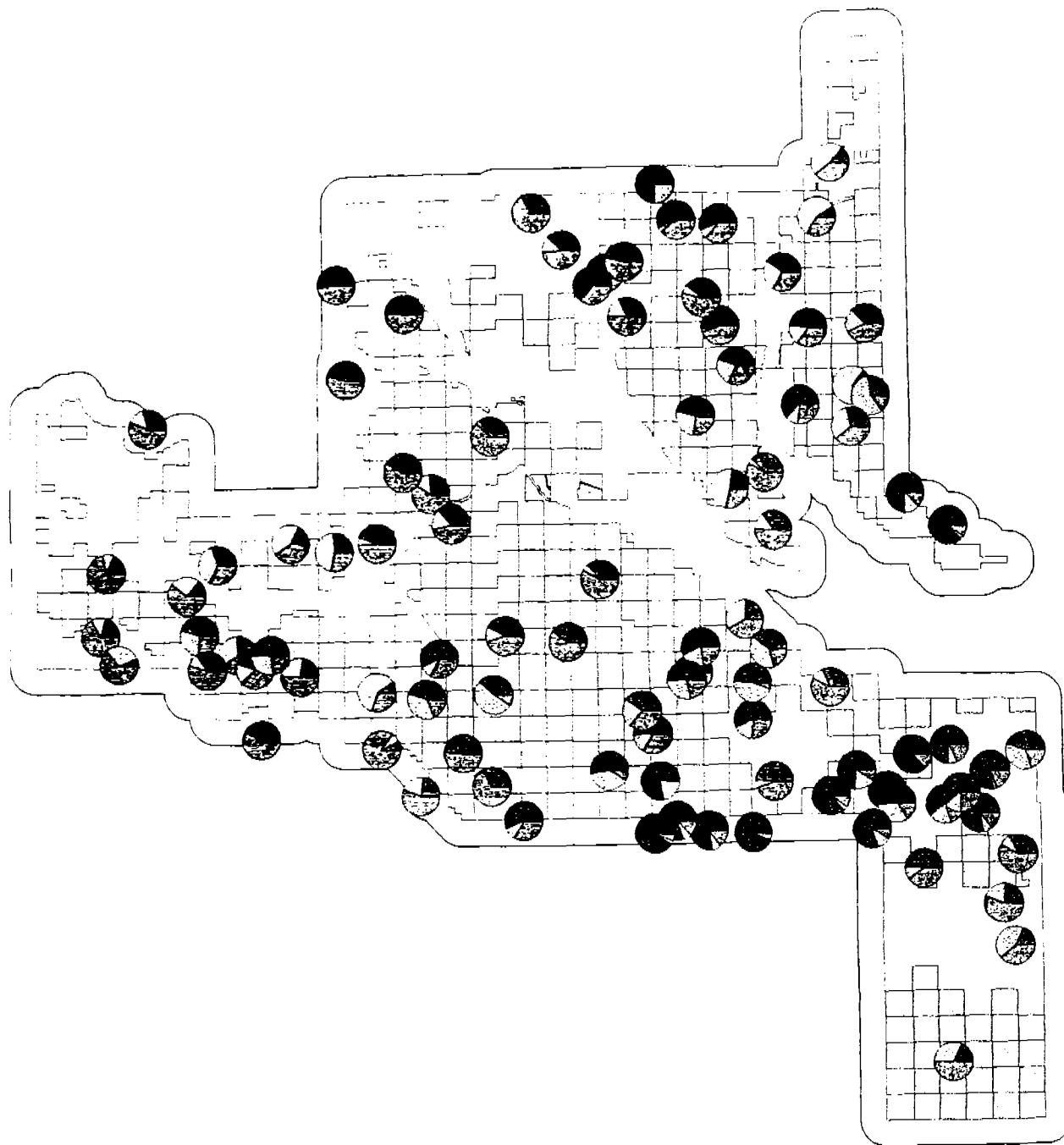
SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 1996 RADIUS: 1.8 Miles
ALTERNATIVE: PROPOSED

Data provided by Plum Creek Timber Company
Map produced by the USFWS, North
Pacific Coast Ecologist, June 16, 1996

0 2 4 6 8 10
MILES

- Circle Segment Colors
- Nesting, Roosting, Foraging (NRF greater than or equal to 40 percent in 35 of 96 Sites)
 - Nesting, Roosting, Foraging (NRF less than 40 percent in 61 of 96 Sites)
 - Forage Dispersal
 - Non Habitat

Figure 3. Types of spotted owl habitat estimated for 1996 within a 1.8-mile radius of existing site centers.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 1996 RADIUS: 0.7 Miles
ALTERNATIVE: PROPOSED

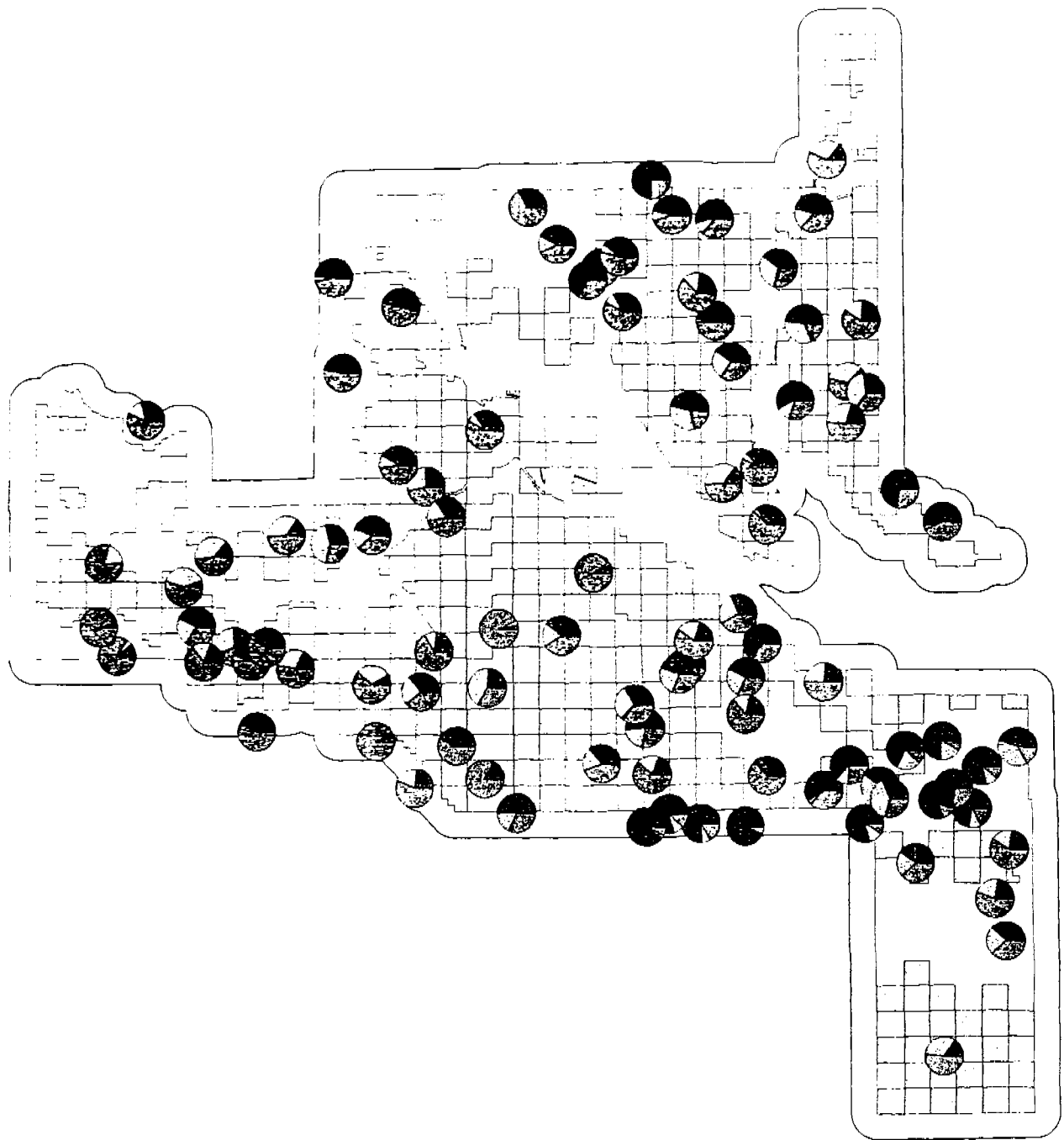
0 2 4 6 8 10
MILES

Data provided by Plum Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 16, 1996

- Circle Segment Colors
- Nesting, Roosting, Foraging
(NRF greater than or equal to 50
percent in 35 of 96 Sites)
 - Nesting, Roosting, Foraging
(NRF less than 50 percent in
61 of 96 Sites)
 - Forage Dispersal
 - Non Habitat

Figure 4. Types of spotted owl habitat estimated for 1996 within a 0.7-mile radius of existing site centers.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 2016 RADIUS: 0.7 Miles
ALTERNATIVE: PROPOSED

0 2 4 6 8 10
MILES

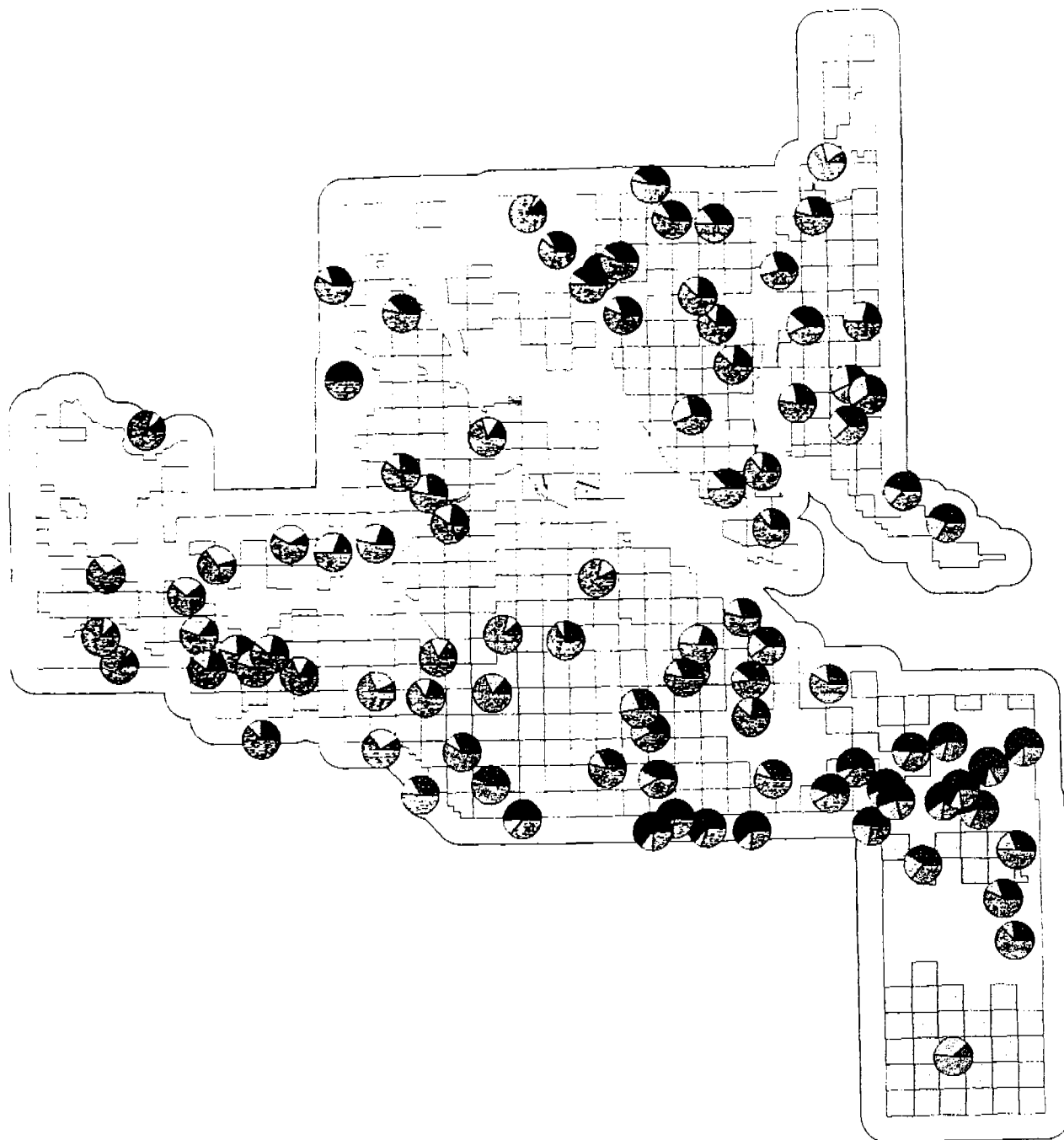
Data provided by Plute Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecological, June 10, 1996

Circle Segment Colors

- Nesting, Roosting, Foraging (NRF greater than or equal to 50 percent in 23 of 96 Sites)
- Nesting, Roosting, Foraging (NRF less than 50 percent in 73 of 96 Sites)
- Forage Dispersal
- Non Habitat

Figure 6. Types of spotted owl habitat estimated for 2016 within a 0.7-mile radius of existing site centers.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 2016 RADIUS: 1.8 Miles
ALTERNATIVE: PROPOSED

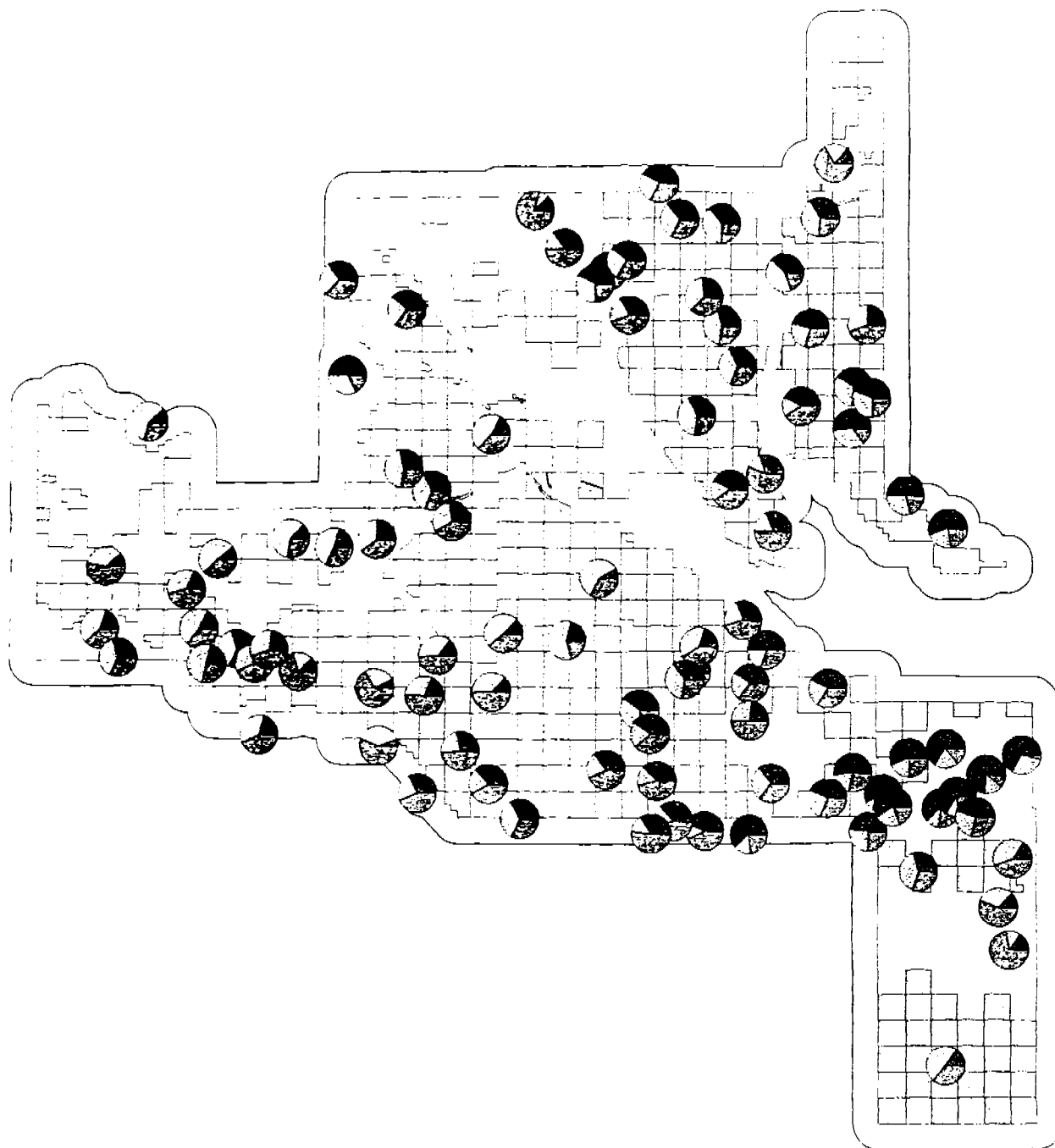
0 2 4 6 8 10
MILES

Data provided by Placer Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecological, June 18, 1999

Circle Segment Colors
 ■ Nesting, Roosting, Foraging
 (NRF greater than or equal to 40
 percent in 26 of 96 Sites)
 ■ Nesting, Roosting, Foraging
 (NRF less than 40 percent in
 70 of 96 Sites)
 □ Forage Dispersal
 ▨ Non Habitat

Figure 5. Types of spotted owl habitat estimated for 2016 within
a 1.8-mile radius of existing site centers.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 2045 RADIUS: 1.8 Miles
ALTERNATIVE: PROPOSED

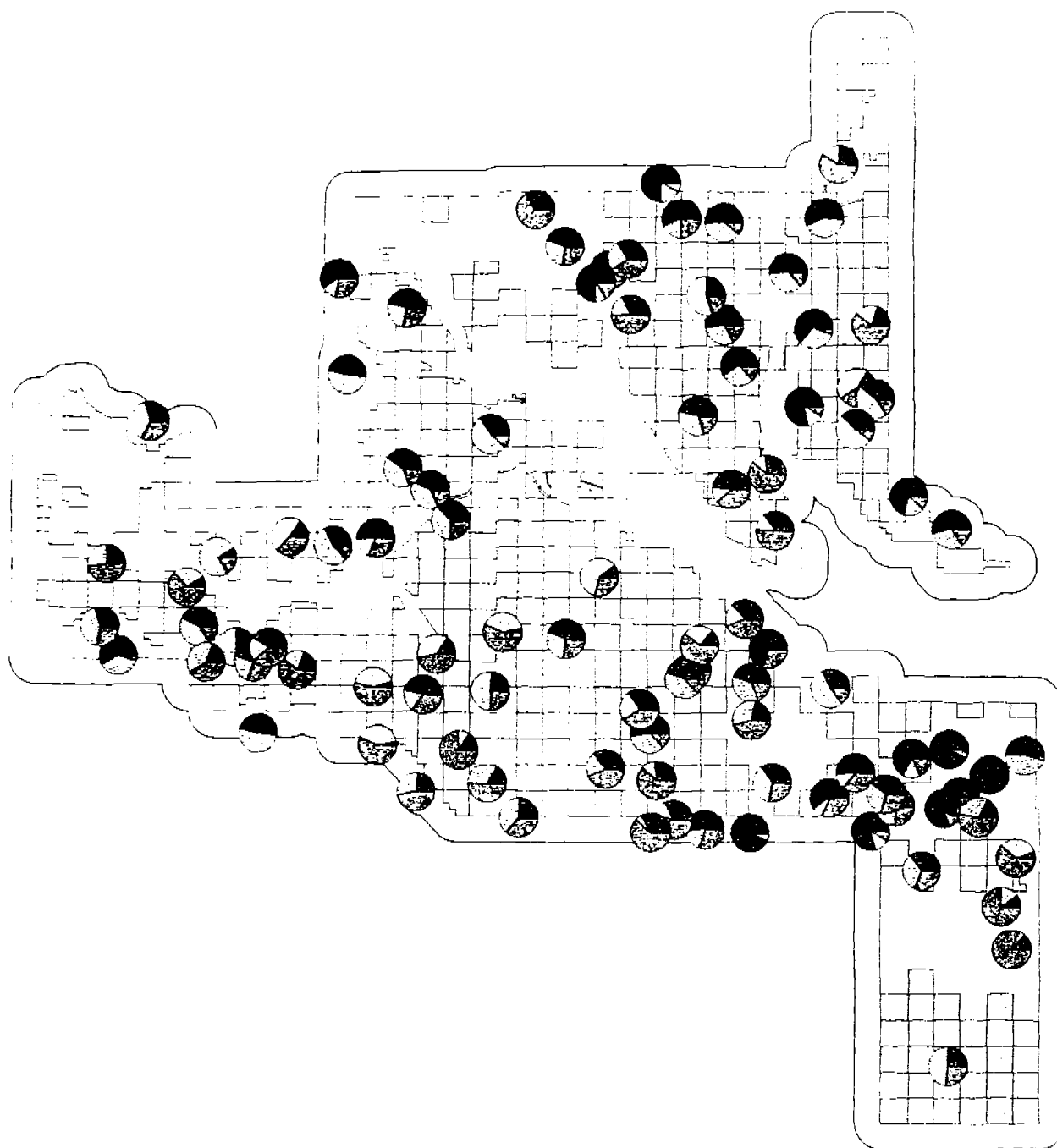
Data provided by Placer Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecological Unit, June 16, 1999

0 2 4 6 8 10
MILES

- Circle Segment Colors
- Nesting, Roosting, Foraging (NRF greater than or equal to 40 percent in 32 of 96 Sites)
 - Nesting, Roosting, Foraging (NRF less than 40 percent in 64 of 96 Sites)
 - Forage Dispersal
 - Non Habitat

Figure 7. Types of spotted owl habitat estimated for 2045 within a 1.8-mile radius of existing site centers.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT AVAILABILITY YEAR: 2045 RADIUS: 0.7 Miles
ALTERNATIVE: PROPOSED

Data provided by Miam Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecological, June 18, 1988

0 2 4 6 8 10
MILES

- Circle Segment Colors
- Nesting, Roosting, Foraging (NRF greater than or equal to 50 percent in 29 of 96 Sites)
 - Nesting, Roosting, Foraging (NRF less than 50 percent in 67 of 96 Sites)
 - Forage Dispersal
 - Non Habitat

Figure 8. Types of spotted owl habitat estimated for 2045 within a 0.7-mile radius of existing site centers.

Fig. 9a. Owl Take, Existing Sites
Proposed Alternative, NRF Only

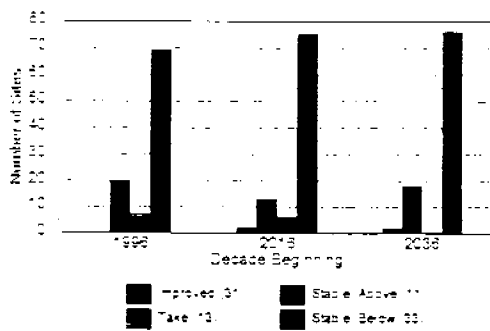


Fig. 9b. Owl Take, Existing Sites
No Action Alternative, NRF Only

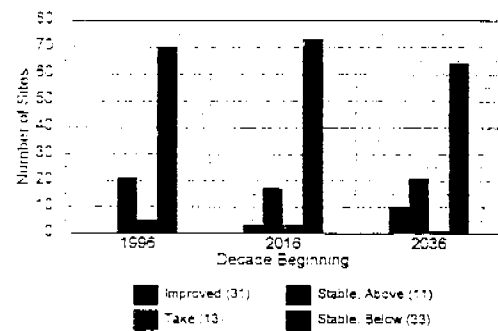


Figure 9. Take of northern spotted owl existing sites.

Fig. 10a. Owl Take, Generated Sites
Proposed Alternative, NRF Only

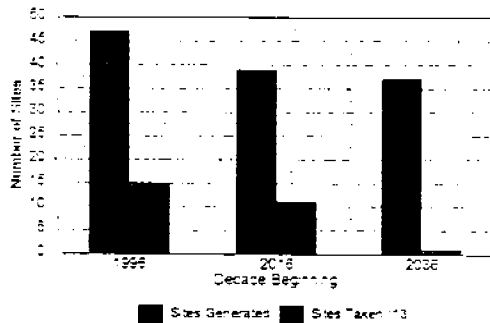


Fig. 10b. Owl Take, Generated Sites
No Action Alternative, NRF Only

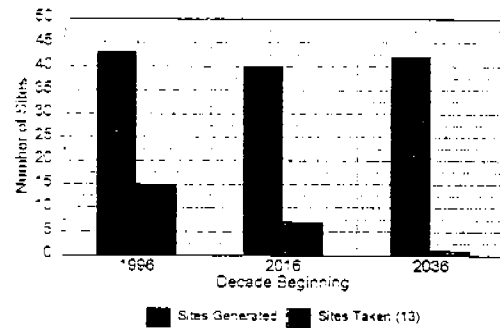


Figure 10. Take of northern spotted owl generated sites.

Fig. 13a, Impact Risk, Generated Sites
Proposed Alternative, NRF Only

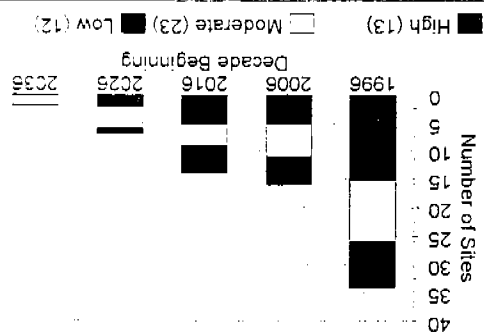


Fig. 13b, Impact Risk, Generated Sites
No Action Alternative, NRF Only

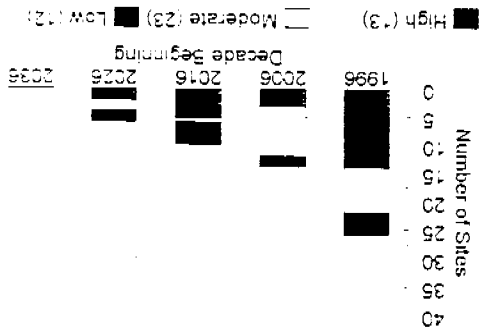


Fig. 14a, Impact Risk, Generated Sites
Proposed Alternative, NRF & FD

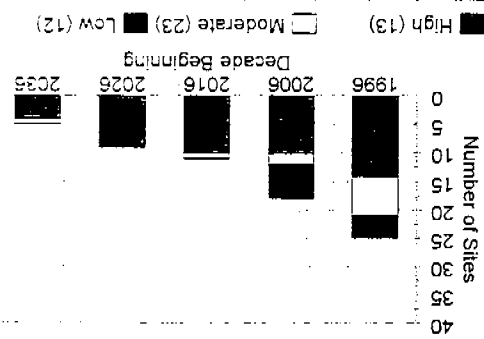


Fig. 14b, Impact Risk, Generated Sites
No Action Alternative, NRF & FD

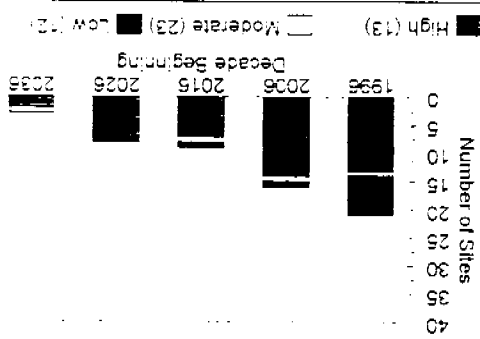


Figure 14. Risk of impact on northern spotted owl generated sites using viability classes and NRF plus FD.

Fig. 15a. Owl Site Generation
Proposed Alternative, NRF Only

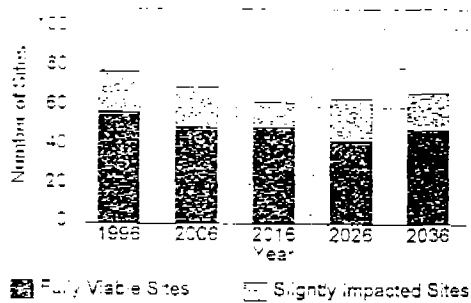


Fig. 15b. Owl Site Generation
No Action Alternative, NRF Only

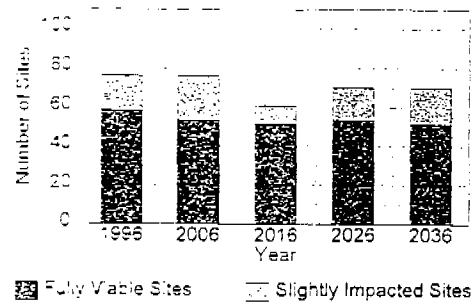


Fig. 15c. Impact Risk, Generated Sites
Proposed Alternative, NRF Only

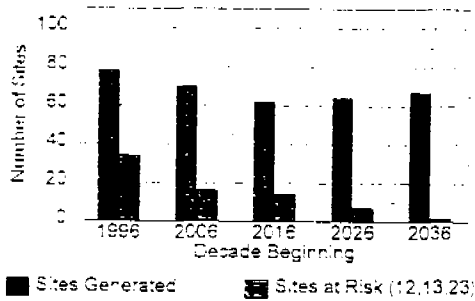


Fig. 15d. Impact Risk, Generated Sites
No Action Alternative, NRF Only

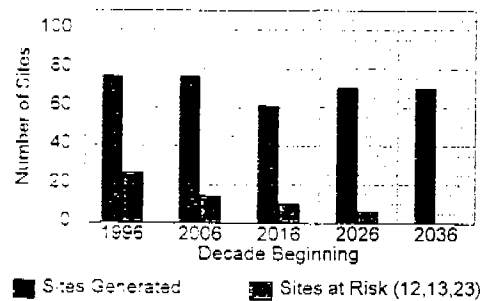


Figure 15. Carrying capacity of northern spotted owl predicted by GIS risk analysis using viability classes and and NRF habitat.

Fig. 16a. Owl Site Generation
Proposed Alternative, NRF & FD

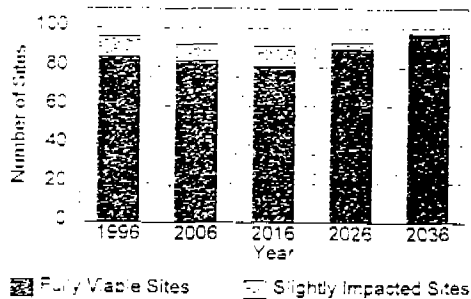


Fig. 16b. Owl Site Generation
No Action Alternative, NRF & FD

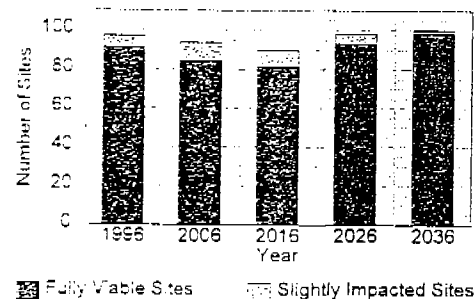


Fig. 16c. Impact Risk, Generated Sites
Proposed Alternative, NRF & FD

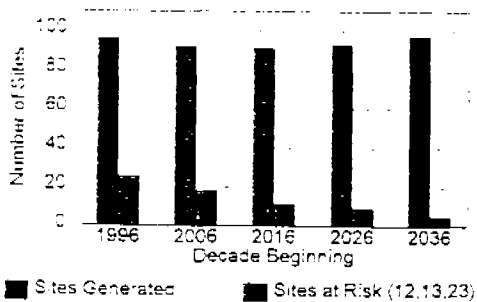


Fig. 16d. Impact Risk, Generated Sites
No Action Alternative, NRF & FD

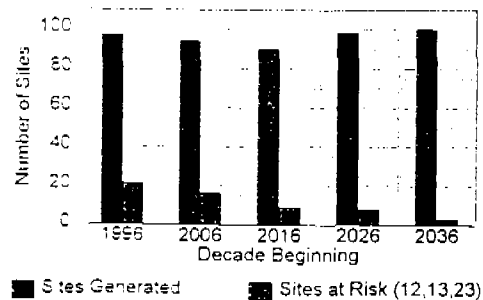


Figure 16. Carrying capacity of northern spotted owl predicted by GIS risk analysis using viability classes and NRF plus FD habitat.

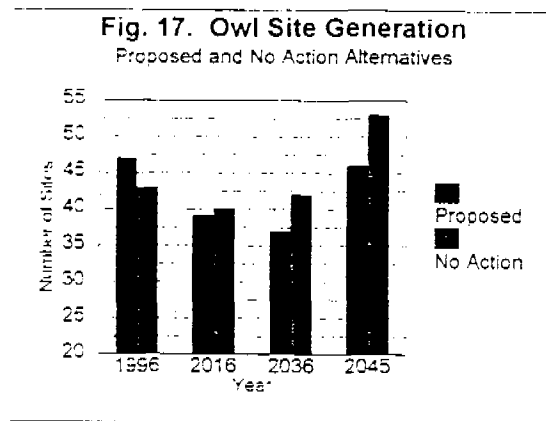
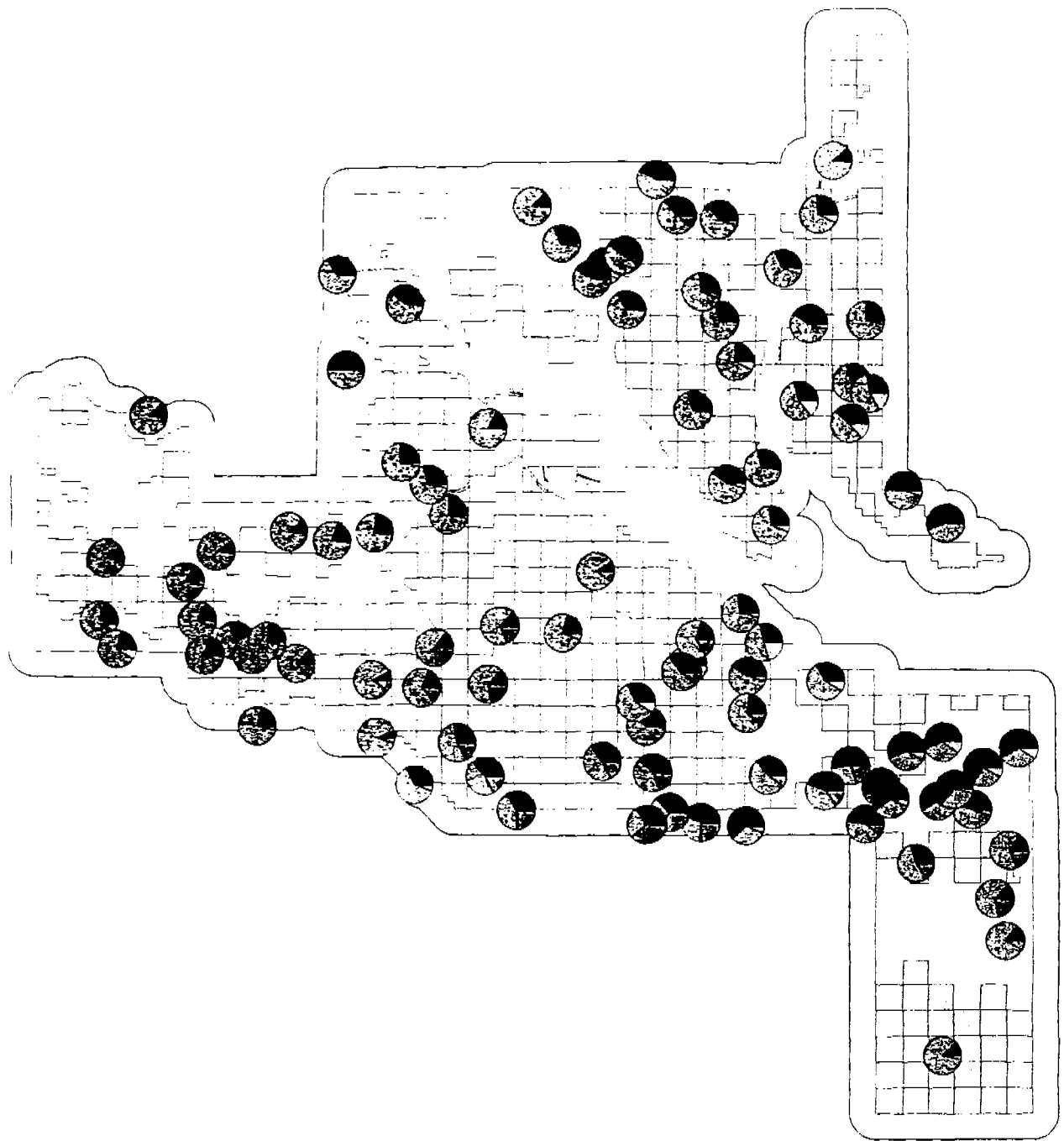


Figure 17. Carrying capacity of northern spotted owl predicted by GIS take analysis using NRF habitat.



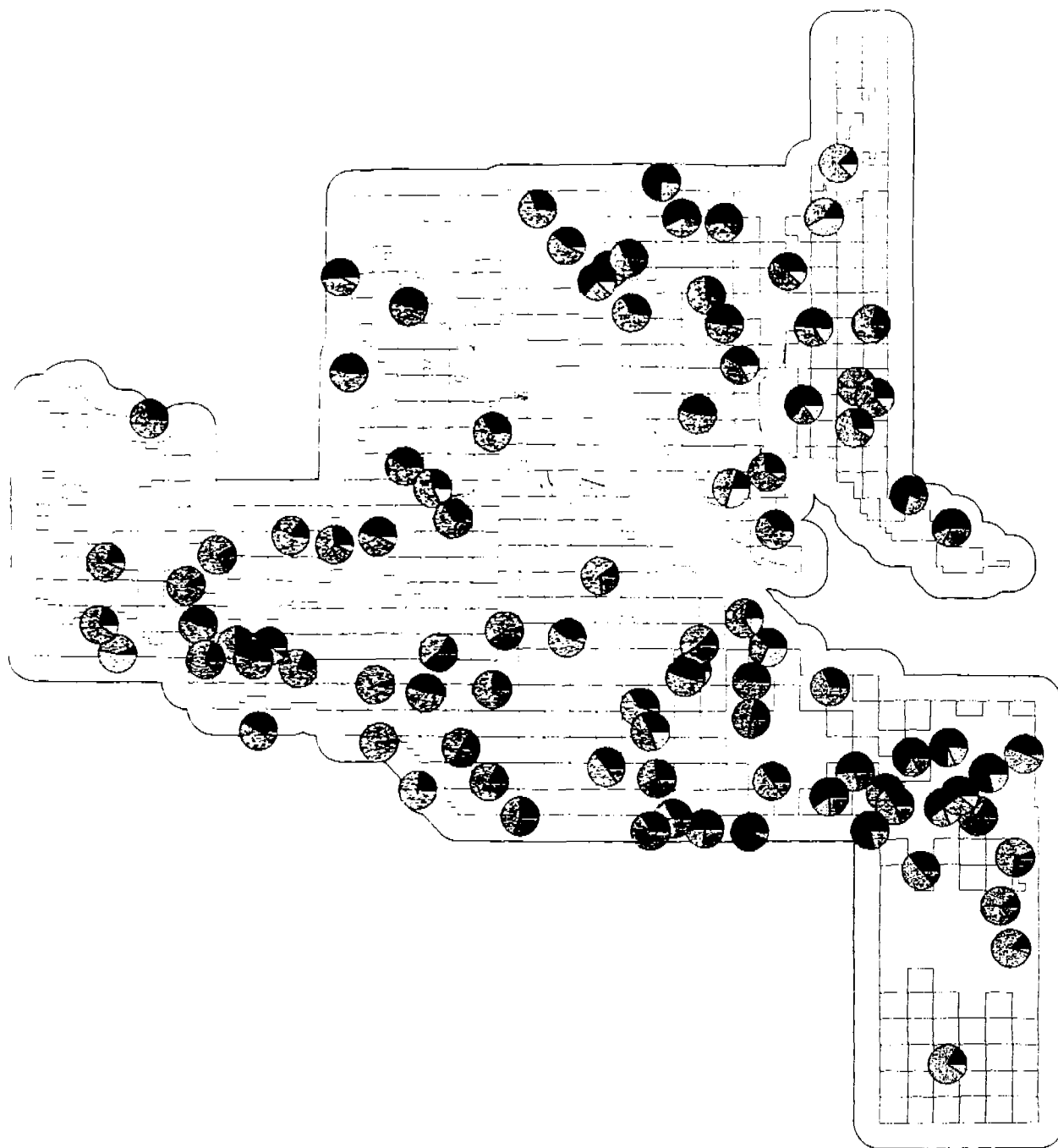
**SPOTTED OWL HABITAT ANALYSIS -
HABITAT CHANGE COMPARING 1996 NO ACTION AND 2045 PROPOSED ACTIONS
WITHIN 1.8 MILES OF EXISTING SITE CENTERS**

Data provided by Plum Creek Timber Company

Map produced by the USFWS, Pacific
Coast Ecoregion, June 16, 1996

- Circle Segment Colors**
- Habitat Baseline
 - Non-Habitat Baseline
 - Increase in Habitat Due to Proposed Action (35 of 107 Sites)
 - Decrease in Habitat Due to Proposed Action (61 of 107 Sites)

Figure 18. Changes in habitat amounts expected between 1996 and 2045 within a 1.8-mile radius of existing sites.



SPOTTED OWL HABITAT ANALYSIS -
HABITAT CHANGE COMPARING 1996 NO ACTION AND 2045 PROPOSED ACTIONS
WITHIN 0.7 MILES OF EXISTING SITE CENTERS

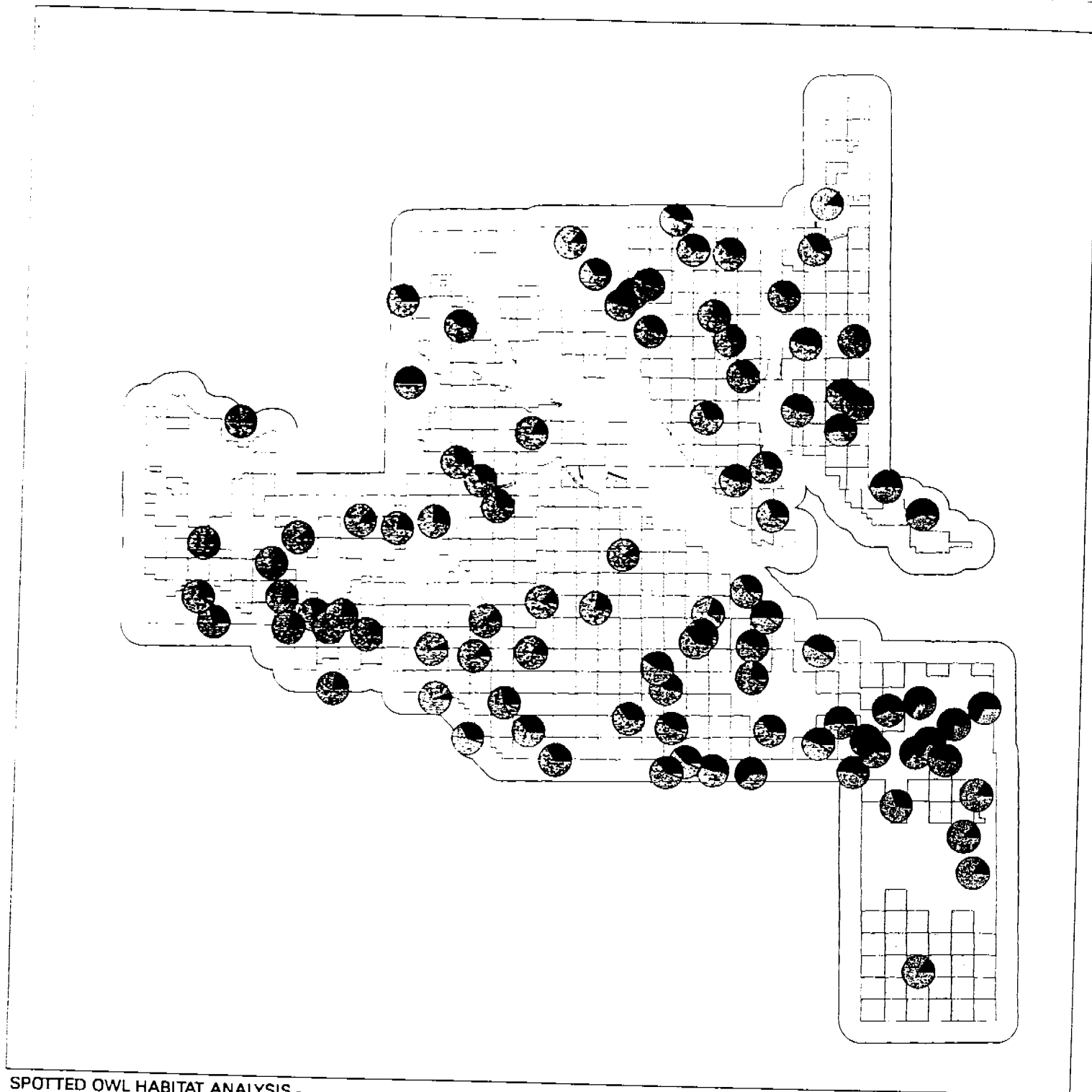
Data provided by Plum Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 10, 1996

0 2 4 6 8 10
MILES

Circle Segment Colors
 ■ Habitat Baseline
 ■ Non-Habitat Baseline
 □ Increase in Habitat
 Due to Proposed Action
 (45 of 107 Sites)
 ■ Decrease in Habitat
 Due to Proposed Action
 (51 of 107 Sites)

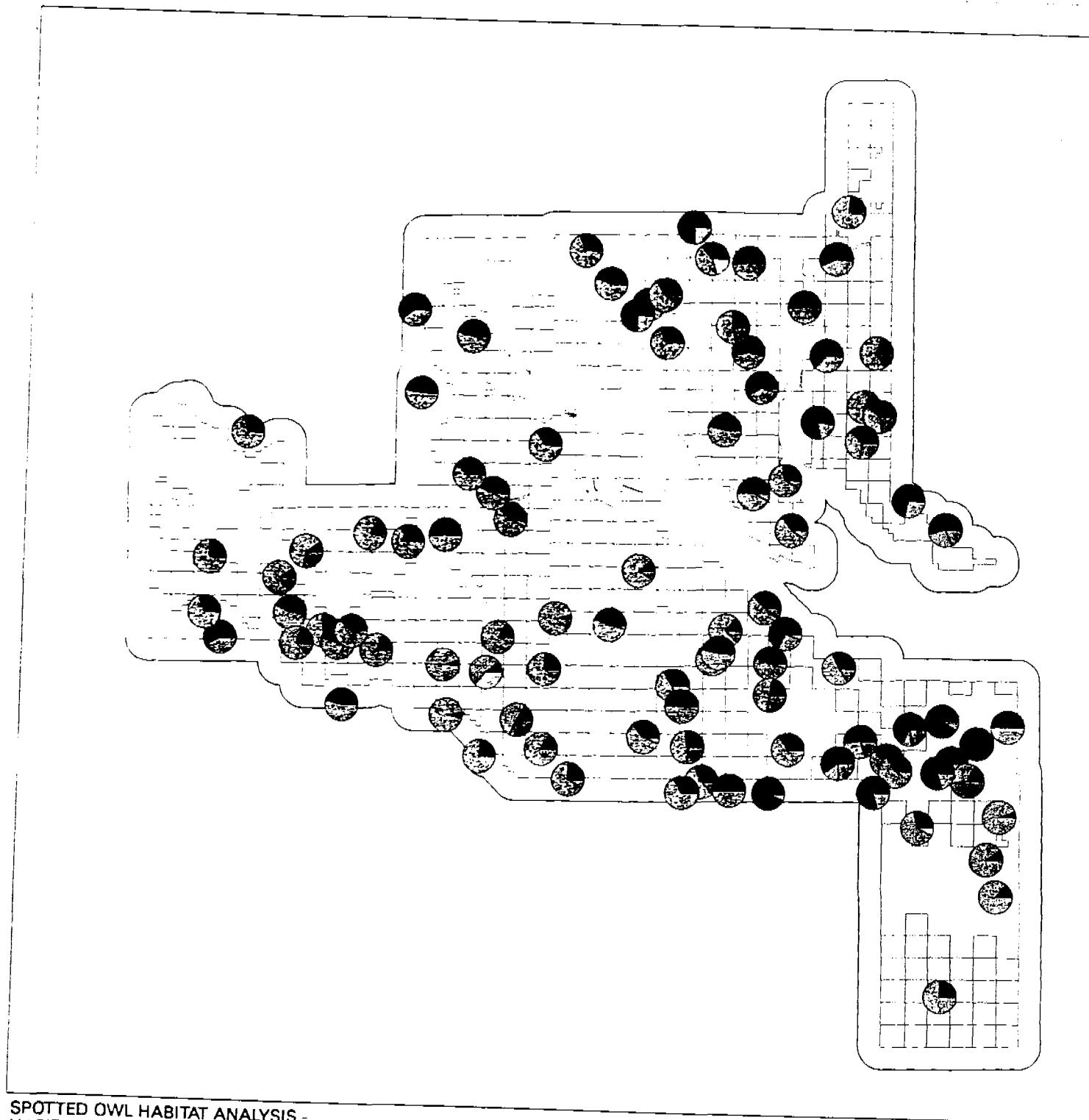
Figure 19. Changes in habitat amounts expected between 1996 and 2045 within a 0.7-mile radius of existing sites.



Data provided by Plum Creek Timber Company

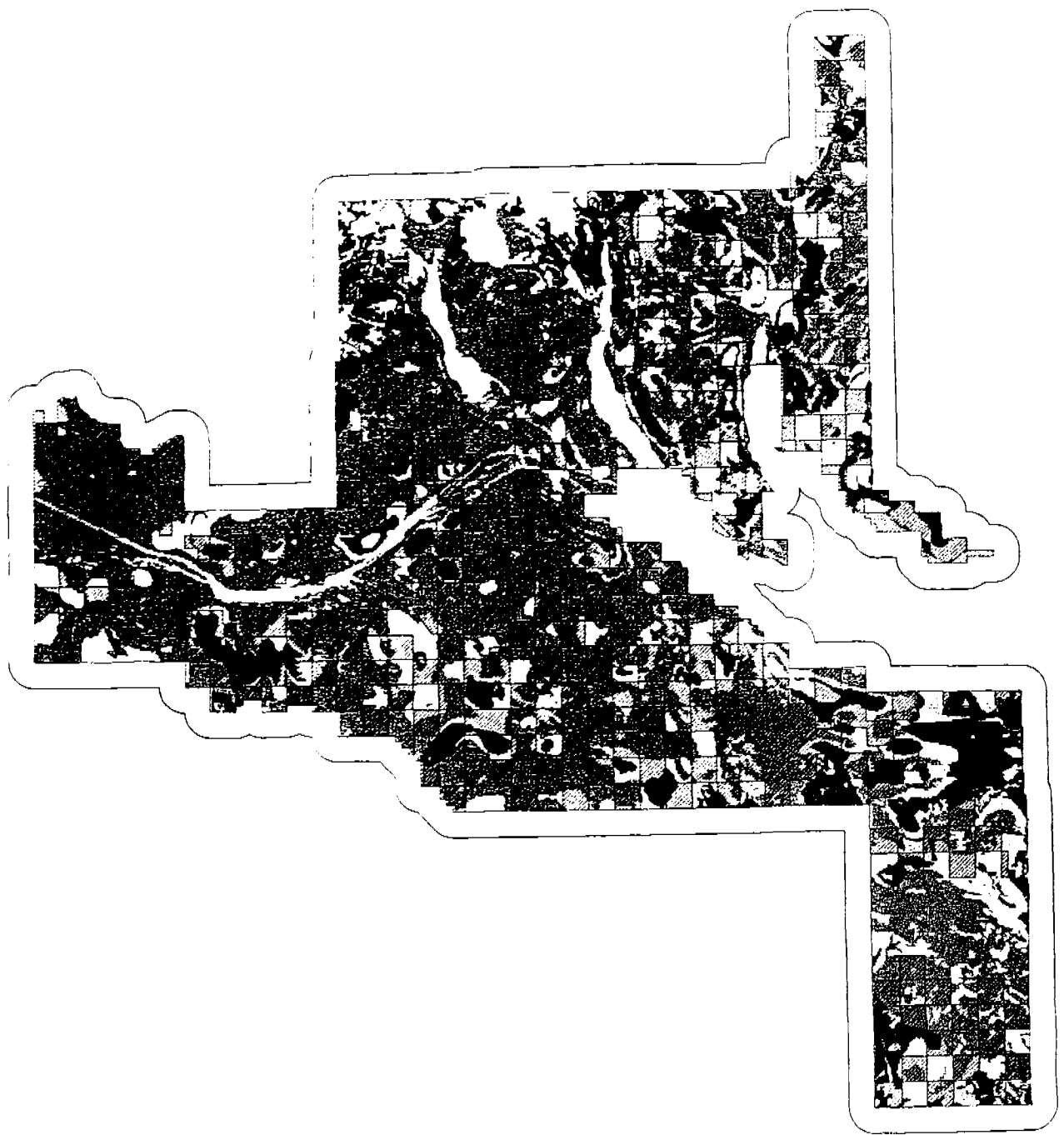
Map produced by the USFWS, North
Pacific Coast Ecological, June 18, 1996

Figure 20. Comparison of habitat amounts expected at 2045 under the HCP as opposed to No Action within a 1.8-mile radius of existing sites.



Data provided by Placer Creek Timber Company
Map produced by the USFWS, North
Pacific Coast Ecoregion, June 18, 1996

Figure 21. Comparison of habitat amounts expected at 2045 under the HCP as opposed to No Action within a 0.7-mile radius of existing sites.



SPOTTED OWL HABITAT ANALYSIS -
Probability Changes, 1996 noaction and 2045 proposed

0 2 4 6 8 10
MILES

STABLE PROBABILITY
HIGH
MEDIUM
LOW
NOT PROBABLE

DECLINING PROBABILITY
HIGH TO NOT PROBABLE
HIGH TO LOW
MEDIUM TO NOT PROBABLE
HIGH TO MEDIUM
MEDIUM TO LOW
LOW TO NOT PROBABLE

INCREASING PROBABILITY
NOT PROBABLE TO HIGH
LOW TO HIGH
NOT PROBABLE TO MEDIUM
MEDIUM TO HIGH
LOW TO MEDIUM
NOT PROBABLE TO LOW

Data provided by Pluth Creek Timber Company

Map prepared by the USFWS, North
Pacific Coast Escarpment, June 23, 1994

Figure 22. Changes in probability of occupancy expected over the first 50 years of the Permit Period

Table 1. Projected habitat amounts for stand structures and lifeform habitats reduced by 10 percent.

PCTC	10%					PCTC - ORIGINAL	2036	2045
	1996	2006	2016	2026	2036			
HCP								
Non	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%	7.9%
SI	5.6%	14.9%	13.8%	6.4%	6.6%	7.3%	7.3%	8.9%
SS	4.4%	3.2%	3.2%	2.2%	2.5%	2.7%	2.7%	1.1%
YF	26.6%	18.5%	14.7%	12.3%	6.0%	6.7%	6.7%	5.4%
PT	7.8%	16.8%	25.4%	28.1%	23.2%	25.8%	25.8%	19.5%
DF	17.2%	12.9%	13.1%	21.3%	29.9%	33.2%	33.2%	38.1%
MF	17.3%	12.9%	9.2%	9.2%	11.3%	12.6%	12.6%	15.0%
MOG	2.8%	2.3%	2.4%	2.3%	2.2%	2.4%	2.4%	2.5%
OG	1.3%	1.3%	1.1%	1.1%	1.3%	1.4%	1.4%	1.6%
Total	90.8%	90.8%	90.8%	90.8%	90.8%	100.0%	100.0%	100.0%
RHAS & Wetlands								
Non	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%	7.2%
SI	2.5%	2.0%	2.0%	0.8%	1.3%	1.5%	1.5%	0.7%
SS	4.3%	2.3%	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%
YF	23.8%	18.8%	9.4%	1.6%	0.4%	0.5%	0.5%	0.9%
PT	7.9%	11.5%	16.5%	14.2%	5.2%	5.8%	5.8%	1.9%
DF	11.4%	13.0%	17.5%	24.7%	29.8%	33.1%	33.1%	29.6%
MF	26.3%	27.5%	27.3%	30.7%	35.4%	44.9%	44.9%	44.9%
MOG	4.9%	5.8%	8.0%	8.0%	8.0%	8.9%	8.9%	10.6%
OG	2.4%	2.6%	2.7%	3.2%	3.4%	3.8%	3.8%	4.2%
Total	90.7%	90.7%	90.7%	90.7%	90.7%	100.0%	100.0%	100.0%
Rocks & Talus								
Non	52.8%	52.8%	52.8%	52.8%	52.8%	52.8%	52.8%	52.8%
SI	2.3%	13.2%	15.9%	11.1%	6.0%	6.6%	6.6%	2.4%
SS	1.1%	0.7%	2.0%	1.7%	5.2%	5.8%	5.8%	1.6%
YF	2.8%	2.5%	5.2%	10.5%	2.9%	3.2%	3.2%	8.6%
PT	7.6%	6.1%	5.0%	7.6%	14.7%	16.3%	16.3%	13.4%
DF	19.9%	14.3%	7.8%	6.4%	7.5%	8.4%	8.4%	13.8%
MF	8.3%	5.2%	5.7%	3.8%	4.8%	5.4%	5.4%	5.7%
MOG	0.4%	0.5%	0.7%	1.3%	1.3%	1.4%	1.4%	1.3%
OG	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%
Total	95.3%	95.3%	95.3%	95.3%	95.3%	100.0%	100.0%	100.0%

Table 1. Projected lifeform habitats reduced by 10 percent -- Continued.

SUITABLE HABITAT -								10%		ORIGINAL					
	1996	2006	2016	2026	2036	2045		1996	2006	2016	2026	2036	2045		
Lifeform 2	64%	66%	70%	75%	80%	82%		71%	74%	77%	83%	89%	91%		
Lifeform 3	64%	66%	70%	75%	80%	82%		71%	74%	77%	83%	89%	91%		
Lifeform 4	39%	34%	31%	31%	35%	37%		44%	38%	34%	34%	39%	41%		
Lifeform 6	57%	53%	48%	43%	43%	42%		63%	59%	53%	48%	47%	47%		
Lifeform 7	65%	65%	64%	62%	59%	56%		73%	72%	71%	69%	66%	63%		
Lifeform 8	58%	53%	56%	60%	54%	49%		64%	59%	62%	66%	60%	55%		
Lifeform 9	60%	61%	62%	61%	59%	56%		67%	68%	69%	68%	65%	62%		
Lifeform 10	62%	57%	60%	69%	72%	72%		69%	63%	67%	77%	80%	80%		
Lifeform 11	65%	65%	67%	72%	75%	76%		72%	72%	74%	81%	84%	84%		
Lifeform 12	49%	55%	64%	74%	79%	81%		54%	61%	71%	82%	88%	90%		
Lifeform 13	56%	47%	46%	54%	59%	63%		62%	52%	51%	60%	66%	70%		
Lifeform 13a	30%	23%	19%	23%	30%	34%		33%	26%	21%	26%	33%	38%		
Lifeform 14	61%	56%	54%	58%	64%	67%		67%	62%	60%	65%	71%	75%		
Lifeform 14a	30%	23%	19%	23%	30%	34%		33%	26%	21%	26%	33%	38%		
Lifeform 15															
Young Aged	37%	37%	32%	21%	15%	14%		41%	41%	35%	23%	17%	15%		
Mid Aged	25%	30%	38%	49%	53%	52%		28%	33%	43%	55%	59%	58%		
Late Aged	21%	17%	13%	13%	15%	17%		24%	18%	14%	14%	16%	19%		
Lifeform 16	64%	66%	70%	75%	80%	82%		71%	74%	77%	83%	89%	91%		
PRIMARY ONLY															
Lifeform 2	45%	49%	55%	67%	77%	80%		50%	54%	62%	74%	85%	89%		
Lifeform 3	45%	49%	55%	67%	77%	80%		50%	54%	62%	74%	85%	89%		
Lifeform 4	36%	26%	19%	19%	28%	31%		40%	29%	21%	21%	32%	35%		
Lifeform 6	31%	23%	12%	3%	2%	1%		34%	26%	13%	3%	2%	2%		
Lifeform 7	47%	46%	44%	41%	35%	29%		53%	51%	48%	46%	39%	32%		
Lifeform 8	39%	39%	43%	43%	32%	23%		43%	43%	48%	47%	35%	26%		
Lifeform 9	43%	43%	43%	41%	35%	29%		48%	48%	48%	45%	39%	32%		
Lifeform 10	46%	46%	51%	62%	68%	69%		52%	51%	57%	69%	75%	77%		
Lifeform 11	46%	46%	51%	62%	68%	69%		52%	51%	57%	69%	75%	77%		
Lifeform 12	45%	49%	55%	67%	77%	80%		50%	54%	62%	74%	85%	89%		
Lifeform 13	39%	29%	26%	34%	45%	52%		43%	33%	29%	38%	50%	57%		
Lifeform 13a	21%	17%	13%	13%	15%	17%		24%	18%	14%	14%	16%	19%		
Lifeform 14	39%	29%	26%	34%	45%	52%		43%	33%	29%	38%	50%	57%		
Lifeform 14a	21%	17%	13%	13%	15%	17%		24%	18%	14%	14%	16%	19%		
Lifeform 15															
Young Aged	37%	37%	32%	21%	15%	14%		41%	41%	35%	23%	17%	15%		
Mid Aged	25%	30%	38%	49%	53%	52%		28%	33%	43%	55%	59%	58%		
Late Aged	21%	17%	13%	13%	15%	17%		24%	18%	14%	14%	16%	19%		
Lifeform 16	45%	49%	55%	67%	77%	80%		50%	54%	62%	74%	85%	89%		

Table 2. NRF habitat as distributed across NWFP landscapes and DCAs.

HCP - NRF ACRES AS A % OF TOTAL ACRES							
DCAs	1996	2006	2016	2026	2036	2045	
PCTC							
WD-7	19%	11%	5%	3%	3%	4%	
WD-8	9%	8%	8%	8%	10%	13%	
WD-39	22%	14%	13%	12%	14%	15%	
WD-40	48%	33%	21%	18%	18%	18%	
Total	27%	18%	13%	11%	12%	13%	
Other							
WD-7	45%	43%	36%	32%	33%	33%	
WD-8	51%	50%	49%	50%	49%	50%	
WD-39	44%	46%	47%	50%	53%	57%	
WD-40	57%	61%	61%	62%	62%	65%	
Total	49%	50%	49%	50%	52%	54%	
Total HCP							
WD-7	33%	29%	22%	19%	19%	20%	
WD-8	39%	38%	38%	38%	38%	39%	
WD-39	35%	33%	32%	34%	36%	39%	
WD-40	54%	50%	46%	46%	46%	48%	
Total	40%	37%	34%	35%	36%	38%	
Option 9							
PCTC							
AMA	15%	8%	8%	8%	9%	9%	
LSR	40%	25%	14%	11%	12%	12%	
Matrix	13%	8%	5%	5%	6%	6%	
Other	70%	70%	63%	63%	63%	63%	
Total	20%	12%	9%	8%	9%	9%	
Other							
AMA	30%	31%	31%	32%	33%	37%	
LSR	50%	52%	52%	53%	54%	58%	
Matrix	28%	24%	18%	15%	12%	14%	
Other	21%	21%	21%	21%	21%	21%	
Total	34%	34%	33%	33%	33%	36%	
Total HCP							
AMA	24%	21%	21%	22%	23%	25%	
LSR	46%	41%	36%	36%	37%	39%	
Matrix	22%	18%	13%	11%	9%	10%	
Other	22%	21%	21%	22%	22%	22%	
Total	28%	25%	23%	23%	23%	25%	

Table 2. NRF Distribution -- Continued.

NO ACTION - NRF ACRES AS A % OF TOTAL ACRES							
DCAs		1996	2006	2016	2026	2036	2045
PCTC							
WD-7		18%	16%	11%	8%	8%	9%
WD-8		9%	9%	8%	8%	9%	14%
WD-39		27%	21%	18%	19%	21%	25%
WD-40		47%	33%	30%	31%	31%	33%
Total		29%	22%	19%	19%	20%	23%
Other							
WD-7		45%	43%	36%	31%	32%	31%
WD-8		51%	50%	49%	50%	49%	50%
WD-39		44%	47%	47%	50%	53%	57%
WD-40		57%	60%	61%	62%	62%	65%
Total		49%	50%	49%	50%	52%	54%
Total HCP							
WD-7		33%	31%	25%	21%	22%	21%
WD-8		39%	38%	38%	38%	38%	40%
WD-39		37%	36%	35%	37%	39%	43%
WD-40		53%	50%	50%	50%	51%	53%
Total		41%	39%	37%	37%	39%	41%
Option 9							
PCTC							
AMA		16%	13%	12%	12%	13%	17%
LSR		37%	25%	21%	20%	21%	23%
Matrix		12%	10%	7%	7%	9%	10%
Other		70%	63%	27%	27%	27%	27%
Total		20%	15%	13%	13%	14%	17%
Other							
AMA		30%	31%	31%	33%	33%	37%
LSR		50%	52%	52%	53%	54%	58%
Matrix		28%	22%	18%	15%	11%	14%
Other		22%	21%	21%	22%	22%	22%
Total		34%	34%	33%	33%	33%	37%
Total HCP							
AMA		24%	23%	23%	24%	25%	29%
LSR		44%	41%	39%	39%	40%	43%
Matrix		22%	17%	13%	11%	10%	12%
Other		22%	21%	21%	22%	22%	22%
Total		28%	26%	25%	25%	25%	29%

Table 3. Stand structure amounts on Plum Creek lands by Forest Class.

Forest Class ¹	Acreage
DF-WH	37,703
NF-SF	31,278
NF/SF/SA	14,494
DF-GF	66,915
PP-LP	6,342
DECID	255
Non-forested	13,222
Total	170,209

Structural Stage ²	Forest Class ¹								
	DF-WH			NF-SF			NF/SF/SA		
	1996	2016	2045	1996	2016	2045	1996	2016	2045
SI	9	16	11	3	11	22	2	21	9
SS	1	7	1	17	2	2	14	<1	2
YF	31	19	4	51	16	7	32	9	18
PT	16	33	32	11	56	16	12	38	10
DF	24	16	41	5	8	26	19	14	37
MF	16	7	10	11	6	25	12	8	13
MOG	<1	<1	<1	<1	<1	<1	6	5	5
OG	1	<1	<1	<1	<1	<1	1	1	3

Structural Stage ²	DF-GF			PP-LP			DECID		
	1996	2016	2045	1996	2016	2045	1996	2016	2045
SI	8	19	4	2	5	3	2	4	3
SS	1	4	1	0	1	0	0	<1	0
YF	26	21	3	6	1	5	6	11	3
PT	4	18	21	9	5	3	24	19	4
DF	23	16	48	44	47	45	60	16	30
MF	28	15	16	30	18	13	6	47	57
MOG	5	3	3	8	21	27	<1	1	1
OG	2	2	3	<1	1	2	<1	<1	<1

¹ DF-WH = Douglas-fir / western hemlock
 NF-SF = Noble fir / silver fir
 NF/SF/SA = Noble fir / silver fir / subalpine fir
 DF-GF = Douglas-fir / grand fir
 PP-LP = Ponderosa pine / lodgepole pine
 DECID = Deciduous

² SI = stand initiation
 SS = shrub/sapling
 YF = young forest
 PT = pole timber
 DF = dispersal forest
 MF = mature forest
 MOG = managed old-growth
 OG = old-growth

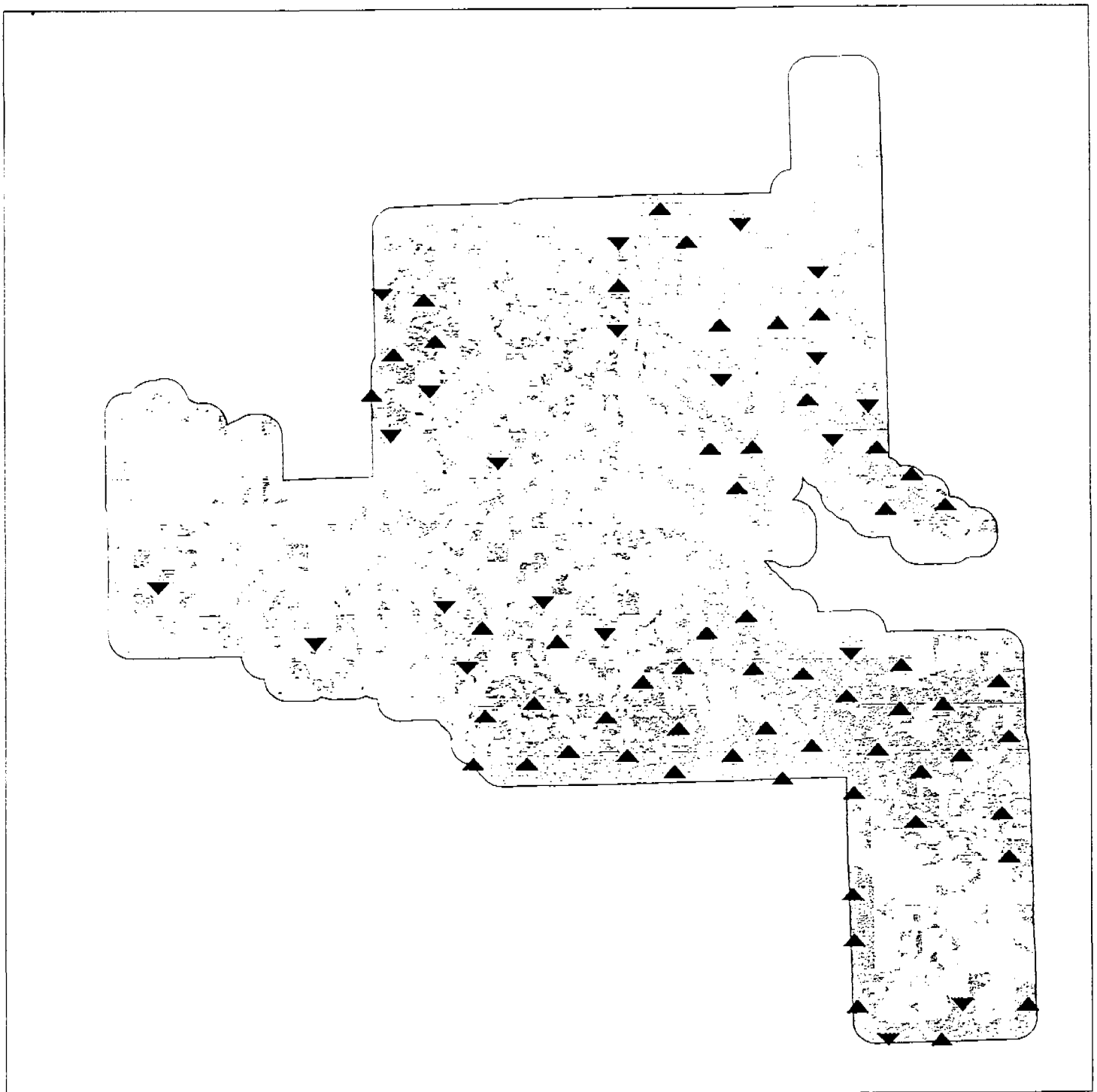
³ Structural stage percentages are based on the total acreage within each Forest Class.

Table 4. Schedule of projected take and impact for the northern spotted owl.




Generated Sites										
Decade	1	2	3	4	5	6	7	8	9	10
Estimated take	15		11		1					
Incremental take	0		4		0					
Estimated impact	34	16	14	7	2	2	2	2	2	2
Incremental impact	8	2	4	1	2	2	2	2	2	2
Static Sites										
Decade	1	2	3	4	5	6	7	8	9	10
Estimated take	7		6		0					
Incremental take	2		3		-1					
Estimated impact	14	8	5	0	2	2	2	2	2	2
Incremental impact	4	3	0	0	2	2	2	2	2	2



APPENDIX I

Tables and Figures



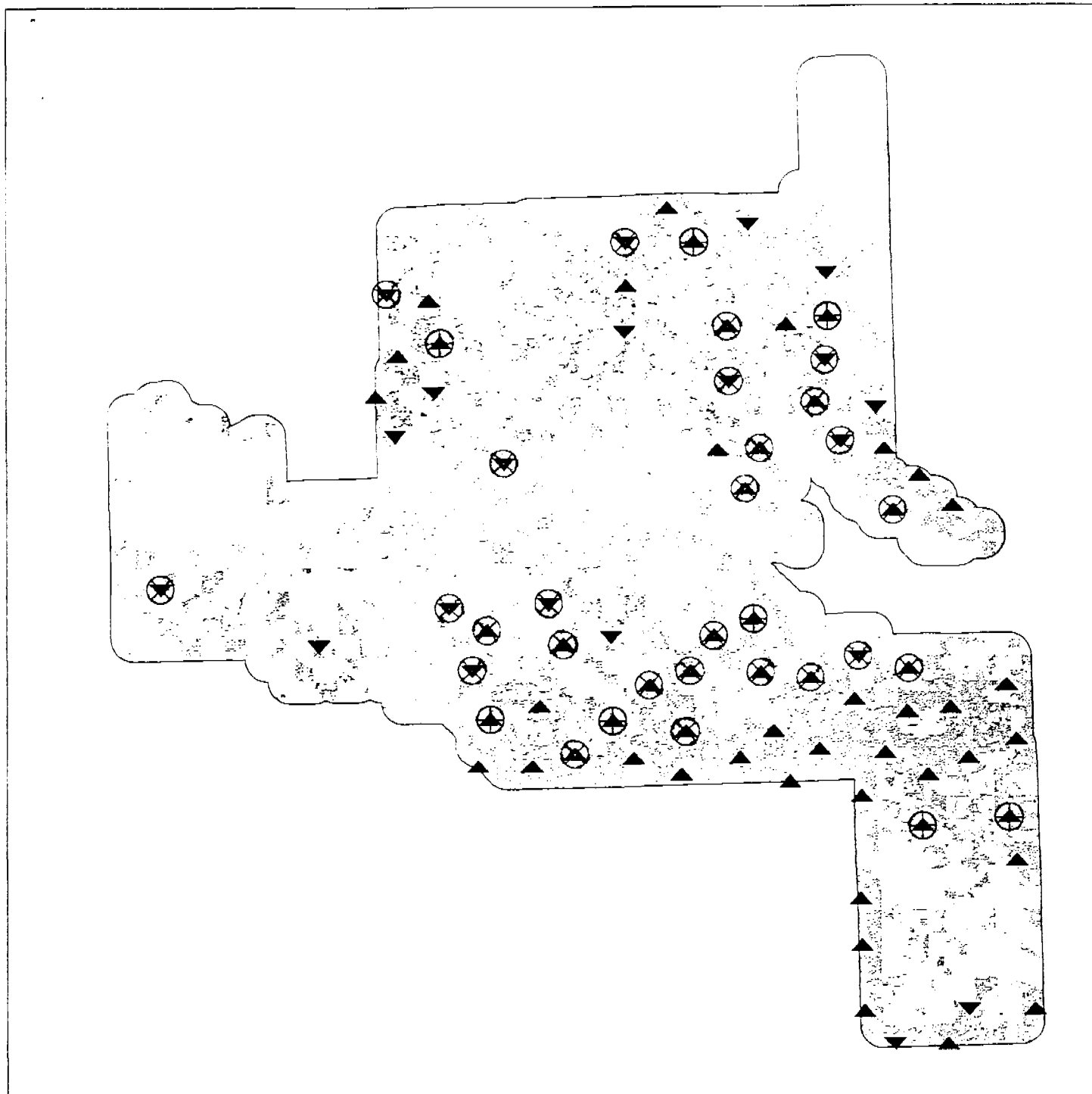
SPOTTED OWL HABITAT ANALYSIS -
NRF HABITAT AND GENERATED SITES FOR YEAR: 1996
UNDER THE PROPOSED ALTERNATIVE

 NRF Habitat
 Other Land Cover
 Land Cover Unknown

 Fully Viable Site
 Slightly Impacted Site





Data provided by Plum Creek Timber Company
 Map produced by the USFWS, North
 Pacific Coast Ecoregion, June 10, 1996

Figure A-1.



**SPOTTED OWL HABITAT ANALYSIS -
IMPACT ON SITES IN 2006 GENERATED IN 1996
UNDER THE PROPOSED ALTERNATIVE**

Data provided by Plum Creek Timber Company
Map produced by the USFWS, North
Pacific Coast Ecoregion, June 10, 1996

- 0 2 4 6 8 10
MILES
-  NRF Habitat in 2006
 -  NRF Habitat Removed Between 1996 and 2006
 -  Other Land Cover
 -  Land Cover Unknown





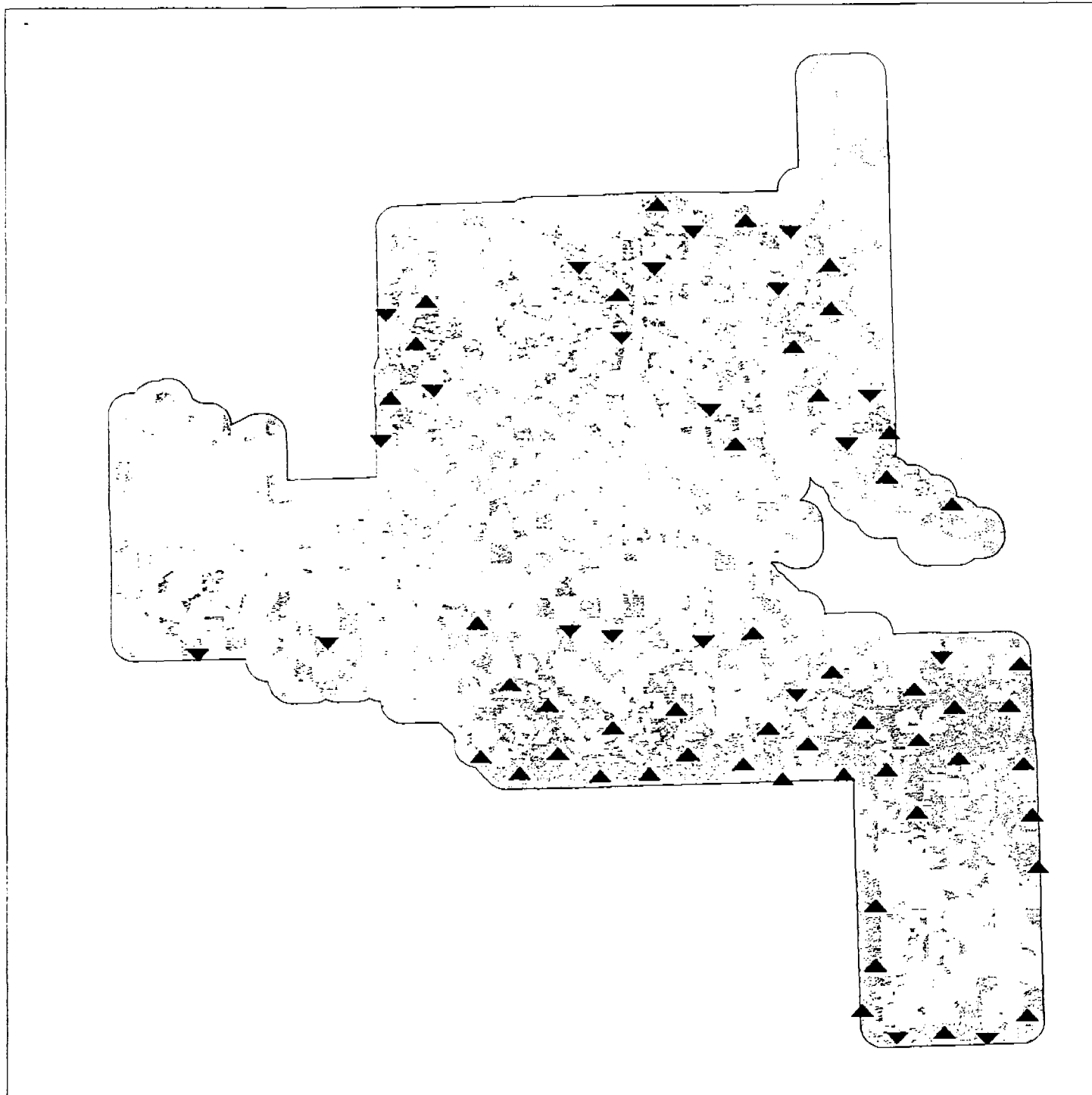
-  Fully Viable Sites Generated in 1996 Habitat
-  Slightly Impacted Sites Generated in 1996 Habitat
-  Low Risk of Impact between 1996 and 2006
-  Moderate to High Risk of Impact between 1996 and 2006



Figure A-2.



SPOTTED OWL HABITAT ANALYSIS -
NRF HABITAT AND GENERATED SITES FOR YEAR: 2006
UNDER THE PROPOSED ALTERNATIVE

0 2 4 6 8 10
MILES

-  NRF Habitat
-  Other Land Cover
-  Land Cover Unknown

-  Fully Viable Site
-  Slightly Impacted Site

Data provided by Plum Creek Timber Company

Map produced by the USFWS, North
Pacific Coast Ecoregion, June 16, 1996

Figure A-3.

TABLE A

alternative	decade	radius	PROPOSED, NRF ONLY, GENERATED SITES	11	12	13	21	22	23	31	32	33	total	viable	impacted	at risk	stable	improved	stable, impaired
P	1996	3000	nrf	0	34	8	1	9	11	0	0	0	78	57	21	34	43	1	0
P	2006	3000	nrf	0	39	5	0	15	6	0	0	0	70	49	21	16	54	0	0
P	2016	3000	nrf	0	39	5	0	9	4	0	0	0	62	49	13	14	48	0	0
P	2026	3000	nrf	0	39	1	3	15	4	0	0	0	64	42	22	7	54	3	0
P	2036	3000	nrf	0	48	0	1	16	2	0	0	0	67	48	19	2	64	1	0
PROPOSED, NRF & FD, GENERATED SITES																			
alternative	decade	radius	PROPOSED, NRF & FD, GENERATED SITES	11	12	13	21	22	23	31	32	33	total	viable	impacted	at risk	stable	improved	stable, impaired
P	1996	3000	nrf	0	67	4	0	4	7	0	0	0	96	85	11	25	71	0	0
P	2006	3000	nrf	0	67	6	0	7	2	0	0	0	92	83	9	18	74	0	0
P	2016	3000	nrf	0	70	0	7	3	1	0	0	0	91	80	11	11	73	7	0
P	2026	3000	nrf	0	80	0	9	3	0	0	0	0	93	89	4	9	83	1	0
P	2036	3000	nrf	0	92	0	4	0	1	0	0	0	97	96	1	5	92	0	0
PROPOSED, NRF ONLY, EXISTING SITES																			
alternative	decade	radius	PROPOSED, NRF ONLY, EXISTING SITES	11	12	13	21	22	23	31	32	33	total	viable	impacted	at risk	stable	improved	stable, impaired
P	1996	xx	nrf	11	28	6	0	4	6	0	3	47	96	36	10	14	32	3	47
P	2006	xx	nrf	11	21	1	1	11	1	0	0	55	96	28	13	8	32	1	55
P	2016	xx	nrf	11	18	0	1	10	1	2	1	59	96	22	12	5	28	4	59
P	2026	xx	nrf	11	21	0	1	10	0	1	2	61	96	21	11	0	31	4	61
P	2036	xx	nrf	11	22	0	2	9	1	2	1	58	96	23	12	2	31	5	58
PROPOSED, NRF & FD, EXISTING SITES																			
alternative	decade	radius	PROPOSED, NRF & FD, EXISTING SITES	11	12	13	21	22	23	31	32	33	total	viable	impacted	at risk	stable	improved	stable, impaired
P	1996	xx	nrf	11	43	1	0	2	1	2	1	41	96	49	3	7	45	3	41
P	2006	xx	nrf	11	37	0	2	2	0	0	0	47	96	45	4	8	39	2	47
P	2016	xx	nrf	11	34	0	2	3	0	5	0	50	96	39	2	5	34	7	50
P	2026	xx	nrf	11	41	0	0	0	0	2	0	53	96	41	0	0	41	2	53
P	2036	xx	nrf	11	40	0	0	0	0	3	0	50	96	43	0	3	40	3	50

TABLE C															
ONLY, GENERATED SITES															
alternative	decade	radius	nr	nf	o	11	13	31	33	total					
p	1996	30	nr	o	0	32	15	0	0	47					
p	2016	30	nr	o	0	28	11	0	0	39					
p	2036	30	nr	o	0	36	1	0	0	37					
p	2045	30	nr							46					
RF ONLY, STATIC SITES															
alternative	decade	radius	nr	nf	o	11	13	31	33	total					
p	1996	xx	nr	11	0	20	7	0	69	96					
p	2016	xx	nr	13	11	13	6	2	75	96					
p	2036	xx	nr	18	11	18	0	2	76	96					

TABLE D											
ONLY, GENERATED SITES											
alternative	decade	radius	nrf	nrf	0	11	13	31	33	total	
n	1996	30	nrf		0	28	15	0	0	43	
n	2016	30	nrf		0	33	7	0	0	40	
n	2036	30	nrf		0	41	1	0	0	42	
n	2045	30	nrf							53	
RF ONLY, STATIC SITES											
alternative	decade	radius	nrf	nrf	0	11	13	31	33		
n	1996	xx	nrf		11	21	5	0	70	96	
n	2016	xx	nrf		11	17	3	3	73	96	
n	2036	xx	nrf		11	21	1	10	64	96	